Stretching the Orthodontic Mind to New Dimensions

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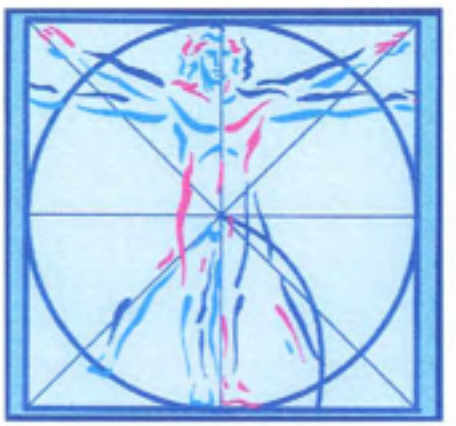

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PREFACE

For the past five decades the author has been led step by step by a long chain of research projects involving both clinical and applied sciences. At the same time, the findings and the resulting developments have been freely and openly shared with colleagues around the world for the common good.

In the past three decades, the research has speeded up by virtue of the advantages by use of the computer. New paradigms emerged.

New ideas were tested. One study alone required that four hundred thousand pieces of data was to be abstracted.

At the same time, developments in other related scientific fields needed to be embraced for thinking if not for their practical value. Combined, this information yielded the basis for the formulation of several concrete principles—indeed Intrinsicalities. Some of these may appear strange or even scary but only because they are different.

Specifically, from interest shown by students and from requests by colleagues for "what is new" or "what is the real truth", this book was written. The author is also routinely asked, "Where are we going in the future?"

History is no more than a record of the events of the past. Evolution, however, offers an explanation for changes recorded. Movements usually occur on a broad front. Yet the automobile and the airplane were started and developed by single young people experimenting in a garage.

As a list of movements accumulated and information needed to be put down for communication in teaching, this book took its present form. The author is indebted to Mr. Martin Brusse and Rocky Mountain Orthodontics for the finances for its printing and distribution.

In 1962, just 40 years ago, the author was charged with writing a chapter in "Vistas of Orthodontics" on his personal clinical research. Currently, may this writing serve as another hallmark of progress.

One fact is certain: the public has become aware of orthodontic service. A privilege is headed for a demand status. It is now up to future generations to deliver the highest quality of supply! May this book help serve that end.

RMR

STRETCHING THE MIND TO NEW DIMENSIONS

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DO YOU UNDERSTAND?

When blank expressions are seen on the faces of students when the foregoing question is asked, the teacher finds it necessary to stop back up and find a new direction in order to proceed. If there is no substratum, there is nothing to build on and less that can be registered in the mind. Many things must be learned before a comprehensive state can be reached.

Memory occurs from great impressions, much repetition and profound associations As learning advances, like letters united for words and then sentences, more and more is included. Thus, learning means expansion--an unfolding and a reaching outward, which never stops. The whole body is associated in the mind.

Orthodontic Progress

The first compilation of information in orthodontics occurred in only about 1850. Fifty years later, less than a dozen people gathered for an organizat on for common interest and mutual benefit. But they all suffered a double handicap. First it was limited materials and manufacturing technology. Second, and of greater consequence, they were constricted by insufficient knowledge in biology. The observations made directly were often misinterpreted due to absence of tools for application of the scientific method.

Currently, several thousand minds are available, a host of manufacturers give us appliances that are like jewels, and competition fosters advancement. Technology and available information has surpassed the ability to communicate, and the mass of literature may be overwhelming.

Barriers

In addition, there are roadblocks to the discovery of new truths. One is habit or custom which gives rise to complacency and satisfaction. Another barrier may be such a lack of disciplined senses that truth will not be recognized even when presented. A third hurdle can be the influence of fragile authority. Unproven ideas have been so attractive and repeated so extensively that they become accepted as general laws. Consequently, there are numerous examples of mere hypotheses coming to be considered solid trustworthy truths. A final stumbling block is the ostentatious belief that we know it all and there is no further need for exploration.

A whole field may suffer because certain ideas may become integrated into an ideology consisting only of beliefs in the first place.

Semantics

Further, there are problems in semantics. Terms may be confusing or not have the same meaning of one as to another in communication. **Philosophy** is often employed to mean a belief system following a particular teacher or technique. But philosophy as a "love of wisdom" takes on phenomena to be reasoned about that have not yet been captured by the scientists' measuring tools.

Logic is the study of ideal thought and truth; ethics is the study of the method of ideal conduct and fairness; esthetics is the study of ideal beauty; politics is the study of the methods of ideal social organization and goodwill; metaphysics is concerned with the relationship of mind and matter and ultimate benefits. So soon as measurements and quantifications are applied and order is established, the term philosophy no longer applies.

Another confusing word is **matrix**. One dictionary gave ten meanings. But a clinician's beliefs may become a matrix. The word originally meant "womb" or "mother" or "ma". It has been described as a place of comfort and a feeling of safety. It is a trustworthy place to return. The gnathologist's matrix is the

articulator. The edgewise orthodontist's matrix is the ideal arch or the continuous wire. As soon as all the teeth are in alignment a comfort zone is reached so that, unfortunately, may become a first priority.

Matrix also is thought of as something from which or within which other things are supported. Consequently, the loose connective tissue supporting organs, skin, muscles and nerves is called the extra-cellular matrix.

If the ideal of "matrix" is extended further, the basic framework of orthodontics consists of an integration of psychological factors together with the formulation of specific objectives. Without direction it is impossible to obtain order and progress.

A **paradigm** very simply is a model or a "pattern". "Para" means along side of. Paracrines are the hormonal signals from one cell to its adjacent cell. A **parameter** is a certain measurement used for the determination of variables. For example, the Facial Axis has been found to be the best parameter for the indication of the central direction of the face.

New Movements and Advancements not Recognized

Analysis of current developments led to the recognition of new movements, which were placed into three general categories. These were:

I. The Basic Matrix (Philosophical and Scientific)

II. Clinical Movements of Significance

III. Mechanical Developments and Technology

Although the whole field was divided into three parts, each item or subject is numbered consecutively for purpose of reference.

PART I

THE BASIC MATRIX

A. General Concepts

Information and Knowledge

Information is a representation of facts transmitted in some form. Knowledge is a medley of facts perceived in the mind. Knowledge has no value until it is retrieved, organized and applied. (Ricketts) Once the mind is expanded to a new dimension, it cannot be contracted. (Emerson) Once a new idea is thought through it cannot be un-thought. (Debono)

Because facts may stand alone, they often may be confusing. Thus, a basic order needs to be established so that knowledge can be integrated and made useful. Further, with the "information highway" of the current world making so much information available, there is a need for abstraction and a certain amount of reduction. Fundamental current truths need to be identified and related in a practical significance.

The Need for Science

The antithesis of order is chaos. Chaos means confusion and leads to frustration and stress. The purpose of science is to create order and provide for the discovery of truth. Science requires measurements. This means tools are needed. Mathematics is the tool to examine the nature of measurement. **But all the powerful statistics mean nothing if the wrong thing is measured or the right thing is measured in the wrong way.** Sweeping conclusions have been drawn from false or unreliable information.

Science itself has various levels. One of the most basic is simple descriptive science, which characterizes roentgenographic cephalometrics.

Sciences in general are divided into the abstract, physical and biological. Science is the "process" by which knowledge is obtained. Basically, matter is examined by chemistry, while energy is studied by physics, but the two are currently often combined.

Research uses science with an aim to revise accepted conclusions when the need is discovered. Pure research has no outside aim other than facts. Basic or primary research is aimed at a prospective clinical inference. Applied research is adaptive to real situations. Clinical research consists of direct examination of patients and their clinical records.

With socialization systems in practice a dichotomy tends to emerge. On the one hand is the mediocre or 'good enough' attitude. Under a social system, an average improvement may be considered to be the proper entitlement. On the other hand, **quality** represents the highest order of good and a high degree of excellence. Ironically, it's as easy in the long run to obtain a routine quality finish by combining science with art. A high quality of result leads to the better opportunity for **a long-term high quality of life for the patient.**

B. Movements–Attitudes

1. The Evidence Based Idea

It is strange to the author that such a statement as "evidence based" could become popularized when it was always assumed that every lecturer or author should speak from true evidence in the first place. Evidence requires scientific "order." No one can predict unless phenomena can be explained satisfactorily. Old clinical observations may require new explanations as biology is better understood.

"Order" means a pleasing arrangement of anything. It consists of sequences, systems, purposes, plans, methods and procedures. Order further means a **freedom from confusion**. It implies elaborateness and the provision for a solution. The VTO and VTG establish order.

"Disorder" means chance alone, haphazardness, displeasing, discomfort and confusion. Thus, "evidence" must be organized in order that it may be applied, which means **science**. With evidence based information the idea of "possibility" is presented and the "probability" odds are clarified.

Cephalometrics and Evidence Basing

Cephalometrics represents the only tool so far for depicting clinical information. Old problems were that measurements employed did not represent the intent. It took the computer to sort out the most cogent parameters, which were reported in 1969 and have been further abstracted. Many influential teachers impeded progress by sustaining of old ideas. But requests for information for new movements continue.

Cephalometric analysis is a determination of the complete nature of the condition. Discovery of polarization and allometric phenomena simplified facial growth for a better understanding. Cephalometrics became the international language of orthodontics. The four-position "transitional analysis" is a "dynamic" for monitoring progress whose time came thirty-three years before this writing. **(Fig. 1 A & B)**

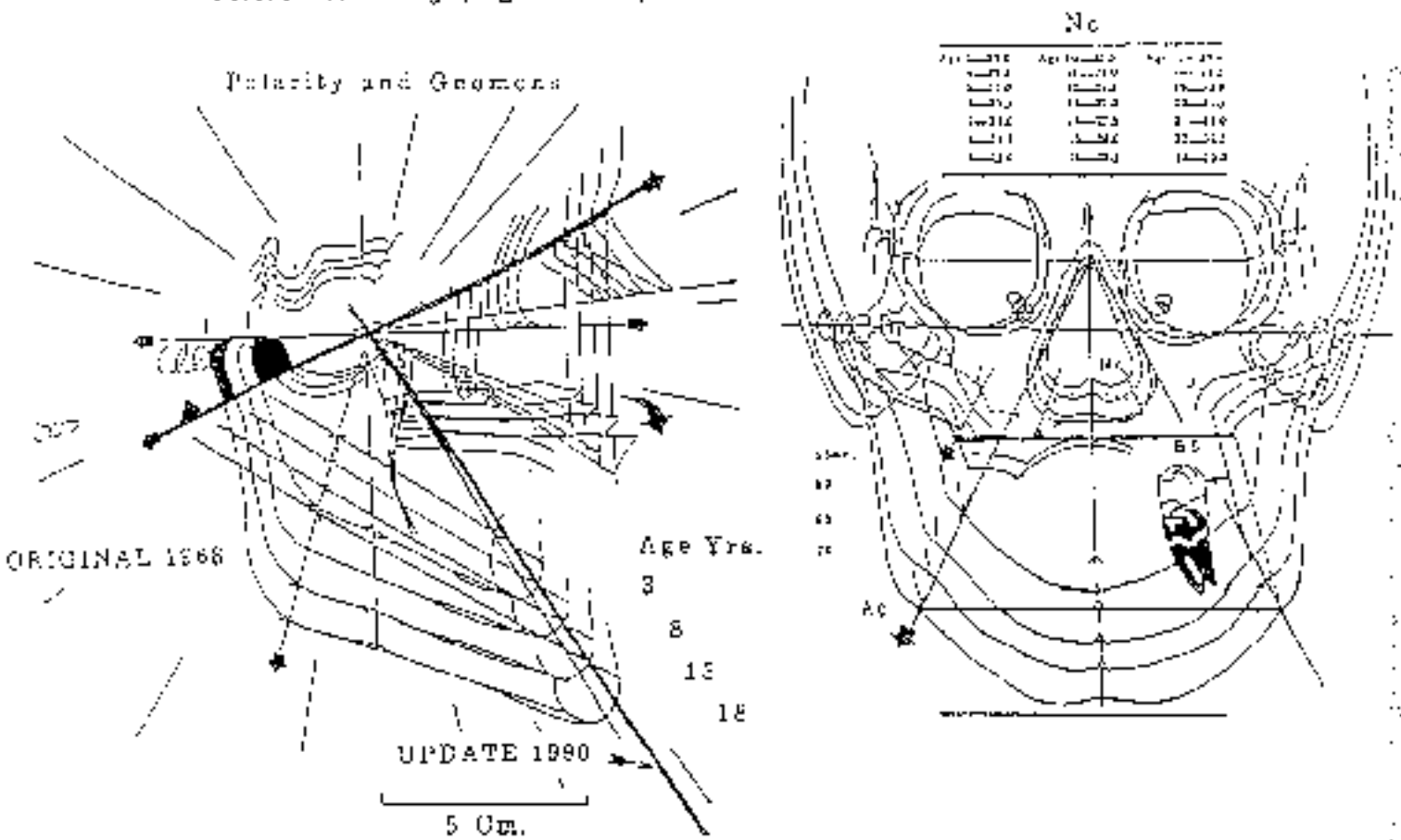


Fig. 1A. Computer explorations verified that polarity exists at the base of the sphenoid bone where mechanical and physiologic phenomena are centered. In the frontal perspective gnomonic expressions were employed because bipolarity was found one for each side of the face.

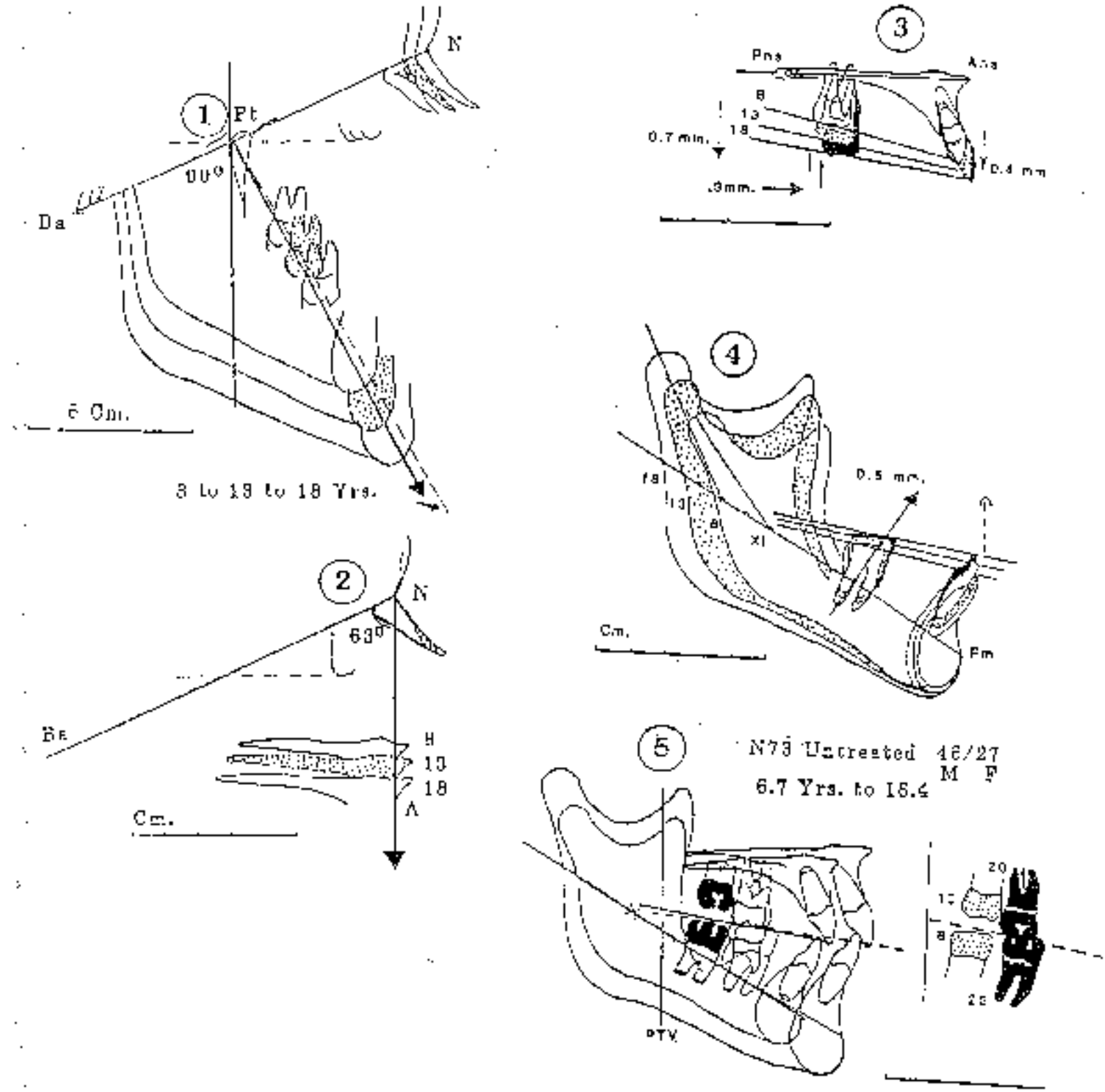


Fig. 18. Tho Transitional Analysis has become the orthodontic standard for depicting the differences between growth and treatment changes. Positions 1 and 2 are for skeletal appraisal. Positions 3 and 4 are for dental changes relatively. Position 5 shows differential changes of upper & lower molars and the behavior of the occusal plane.

2. Six Major Objectives in Orthodontics

It is a paradox that objectives are "predetermined" by a clinician's belief in possibilities. First and ironically, because the vast majority of orthodontists do not monitor patients regularly, they must rely on lectures, literature or discussions with colleagues regarding true possibilities. Secondly, because **different appliances are applied in many ways**, there may be disagreement among investigators and clinicians regarding the possible outcome. Thirdly, there has been an entrenched **doctrine of limitations that emerged from techniques employed seventy years ago**. Many of these limitations still dominate graduate teaching but are profoundly wrong. On a current basis, six objectives are dominant.

a. **Esthetics** has been and always will be the force that empowers orthodontics. The differences in esthetic possibility lie in conceptions of the local dento-alveolar area as contrasted to "basal skeletal" structures (without surgery). This belief further extends into the age at which treatment is instituted. Present information directs attention to starting patients by no later than age 5 years, which is a shock to traditional beliefs.

b. The objective of a skeletal **maxillo-mandibular** congruity in all three planes of space is attainable, particularly with early intervention. Skeletal changes seem to be possible as long as effective growth of the patient remains. However, current data suggests it is easier to obtain and is more permanent in the Preventive and Interceptive Phases than waiting until adolescence.

c. The objective is to obtain a **unitization** of the two basic **vegetative systems**. When skeletal corrections of jaw relations are achieved, a normalization of several functions of the masticatory and respiratory systems naturally follows most often.

d. The most appropriate denture emplacement for the patient's age, sex and type follows the objective of skeletal correction. **The long-term goal is optimal esthetics and functional harmony at maturity.**

e. The objective is to produce the most **consummate** occlusion or arrangement of the teeth. This means their fit, their function and their permanent health.

f. The objective is finally to enhance the **patient's quality of life** through maintenance of the occlusion and through education toward life extension. **(Fig. 2)**

3. Objectives in Total Patient Welfare

Research has again supported the idea of relationship exists between oral health and cardiovascular fitness. General Medicine, and particularly Integrative Medicine, recognizes this importance. The public now seeks a quality of life and greater longevity. Degenerative changes have come under the surveillance of dentistry as well as medicine. **Nutrition** has become quite closely linked to the immune system. It is to be remembered that digestion starts in the oral cavity.

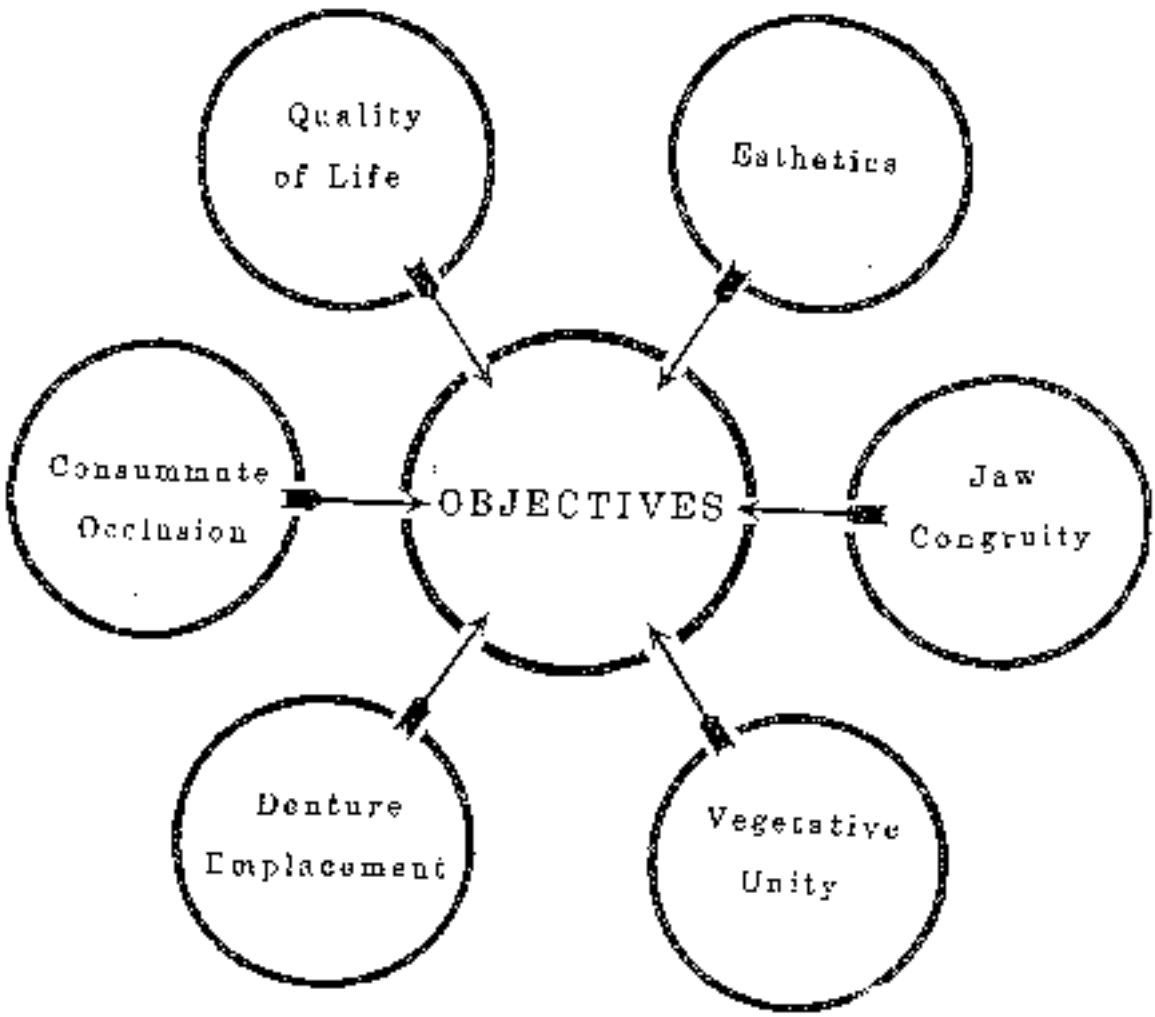


Fig. 2. A comprehensive statement of contemporary objectives in clockwise hierarchy

C. Movements In Physics

4. Tillerian Physics

A new physics has been developed which we shall call "Tillerian". Classical physics has been called "Newtonian". It was thought that energy was converted in form. Motion and mechanics, pressure, optics and electricity were and still are classic. Quantum physics emerged with the study of the atom, the molecular structure and solid state phenomenon. It became recognized that energy could be fixed. But nowhere in physics was there recognition of human intention.

With carefully controlled experimentation, Dr. William Tiller has shown that several long-held theories in physics must be modified. Human intention was captured on electronic devices when N 1 gauge symmetry was present in electric monopoles and magnetic dipoles were provided.

Through conscious intent the pH of water has been shifted up or down one full unit. *In vitro* work with enzymes has altered the production and action of ALP (alkaline phosphatase), a specific liver enzyme. By using the fruit fly because of the vast data available, the growth cycle has been speeded up or delayed by conscious intent. But even more dramatic, **space itself has been conditioned**. This Dr. Tiller has called "vacuum energy", which travels much faster than light. It is thought to be the prana or chi of the eastern cultures.

All these findings can enter into the concept of healing. They further reflect the role of Love in physical phenomena. In other words, the role of consciousness has been neglected, as all investigators understand the power of placebo.

5. Access to "Patterns"

By way of access to "electromagnetic discharge" of the body, a reading of the body's health condition is attained. It would seem that this is a "hologram-like" phenomenon in which a new diagnostic regime is possible. Further, treatment can be instituted by energetic support for the organ or tissue. It could be, but unproven as yet, that this may be accessing the vacuum or etheric energy proven by Tiller and can be a part of the energy medicine movement underway as described by Dr. Richard Gerber. The body is both a receiver and a sender of this form of influence.

6. Disintegration of Mass

A machine has been developed which will disintegrate materials through resonance and without direct bombardment. Numerous applications are available, but when foods and herbs are processed, the cellulose envelope is disintegrated. This, in theory, makes food and minerals several times more bio-available. It is also an opportunity for the reprocessing of wastes.

7. Vortex Energy and Paramagnetics

Technology for the production of funnel vortex is a second method of mass reduction. This process, however, converts foods, ordinarily neutral, to possess paramagnetic properties. This technology presents opportunities for treatment of many types of materials and explores the opportunities for the energy of implosion. Magnets have a deeper implication than most scientists realize. (Fig. 3)

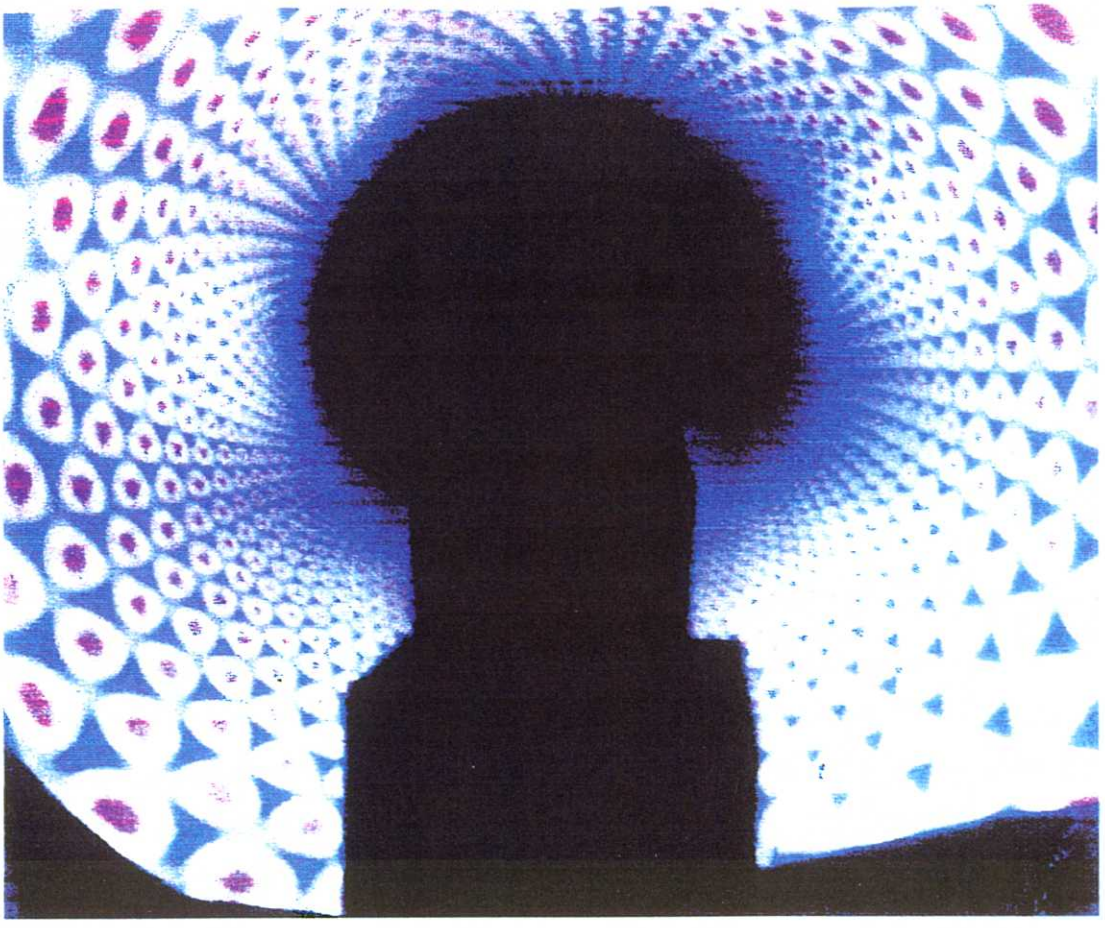


Fig. 3.

With cathode rays the longitudinal lines of energy are photographed. The red center of each "cable" is the positive potential while the surrounding is the negative potential. The greater the distance, the larger the cable. Note the spirals and the graduated divine proportions. Do the divine proportions in the face and body originate from magnetism?

8. Allotropic Conversions

An isotope is two or more forms of elements having similar properties and the same atomic number, but different weights. Allotropes are different. Allotropy is property of certain elements to exist in different forms with different physical and chemical properties. For instance, carbon is different in diamond, graphite and anthracite. Through discrete processes some elements produce different qualities which may alter their biologic effects. But also, new metals with new properties and even color and weight can be produced.

D. The New Biology

9. Etheric Phenomena

The identification of an **etheric phenomena** or what we may call etheric discharge has changed some of the concepts of healing. Data indicates there are significant benefits from prayer in healing, and the mechanisms are becoming clearer. The fact that space can be conditioned and that Love can have a tangible effect brings to focus a new biology. Data indicates that loving care enhances plant growth, and cows produce more milk in a loving environment. The hypothalamus may be involved in the effects of mind and matter, which, ironically, involves the field of metaphysics.

10. Cell Membrane As Its Brain

The cell membrane on the cell surface selects and transmits chemical signals to the cell cytoplasm. Proteins and transmitters in the cytoplasm in turn feed back to the cell membrane what it is to accept or excrete. These membrane receptors are extremely numerous and are critical to the cell function. With such a feedback, the cell becomes adaptive. This has altered the concept of evolution and growth. The nucleus of the cell acts more like the gonad and is more restricted to growth processes and repair.

A T Killer Lymphocyte can kill 27 cancer cells before it dies. **(Fig. 4)**

11. The Final Environment: Interstitial Fluid

The final environment of the cell is the interstitial fluid. It contains the blood and lymph capillary network. It is the site of nerve endings both autonomic and central. It contains fibrocytes, histiocytes, plasma and mast cells. It is a reservoir for oxygen and all kinds of nutrients and peptides.

In addition, this fluid is the control area for acid-base balance and electrolytes. Being remarkably like the characteristics of seawater, it also is the receiving tank for cellular wastes. **(Fig. 5)**

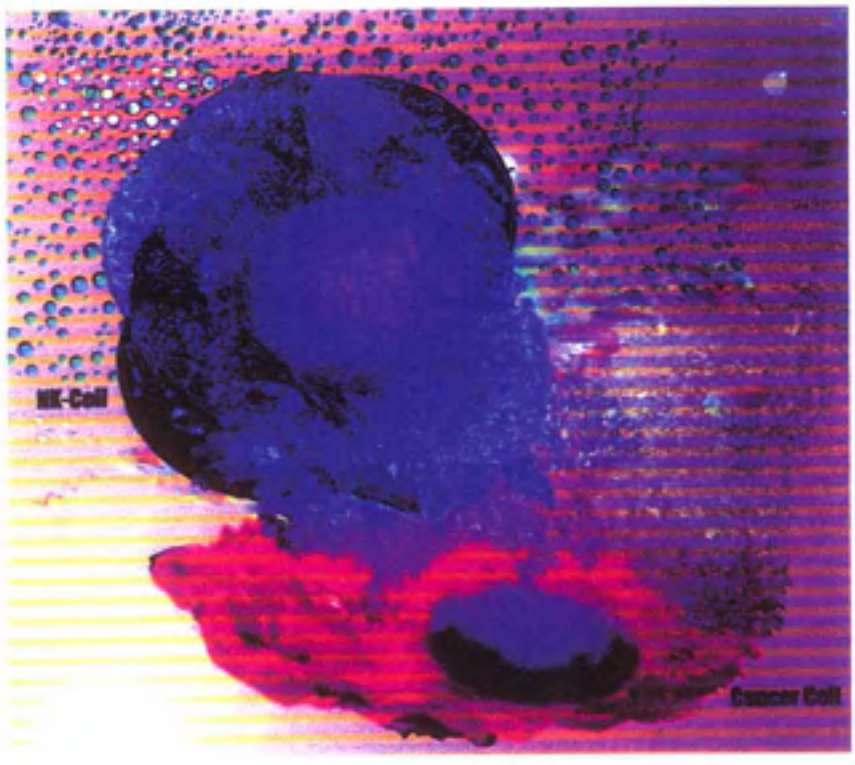


Fig. 4 Photograph of T Killer Lymphocyte contacting and killing a cancer cell.

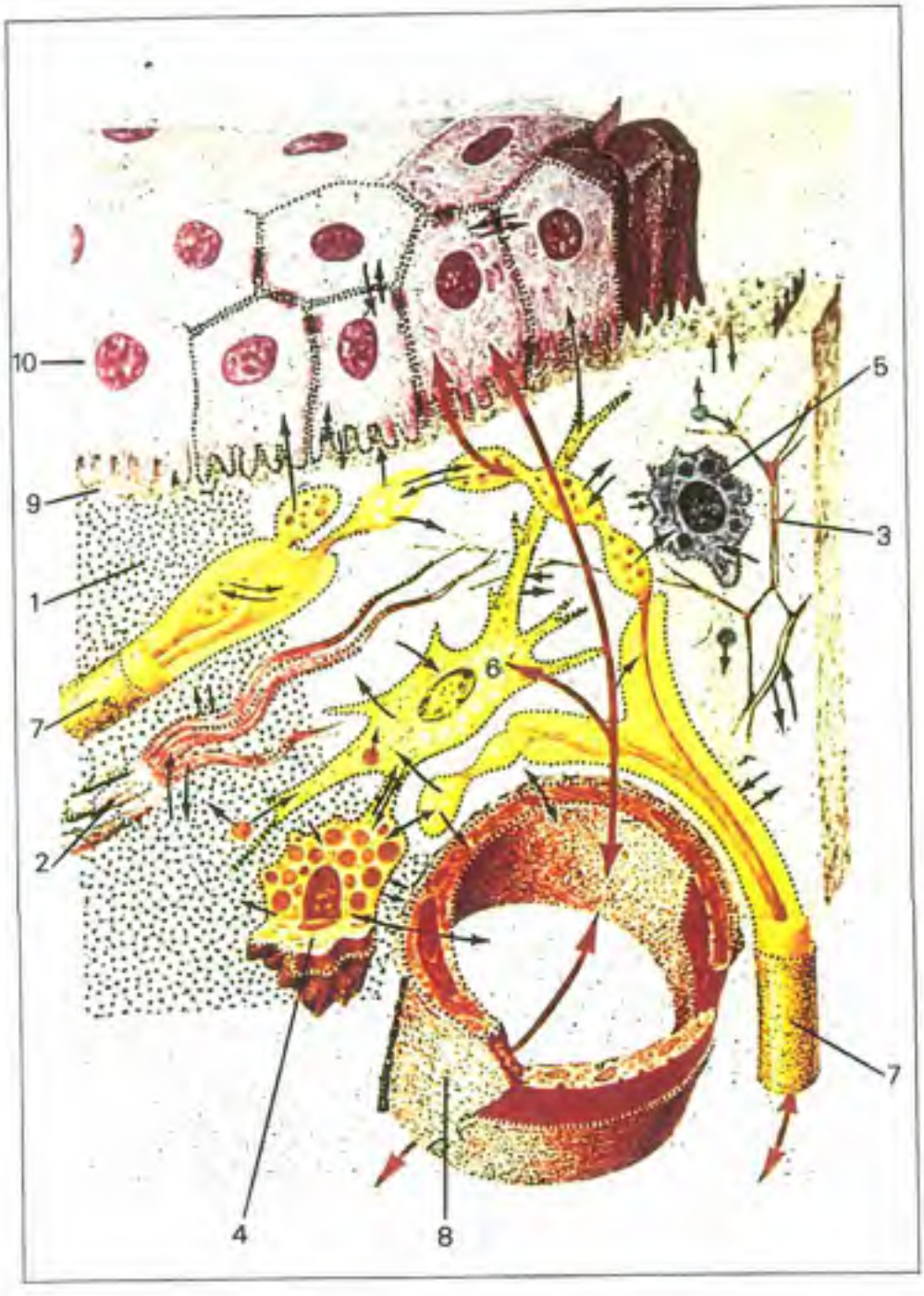


Fig. 5. The extra-cellular matrix containing interstitial fluid is the key to biology: 1) glycosamino glycans, 2) collagen, 3) elastic connective tissue, 4) mast cell, 5) defense cell, 6) fibrocyte, 7) nerve endings, 8) capillary 9) basement membrane, 10) cell with nucleus

Photo from *Matrix and Matrix Regulation*, A. Pishinger, MD, 1975

12. Enzyme and Hormonal Regulatory Functions

The Interstitial fluid is also a most vital communication network. Enzymes are like the trigger on the gun. Hormones are a part of the powder. The endocrine glands are a major part of the regulatory mechanism. However, autocrine functions operate by cell to a distant cell communication to each other within the fluid.

13. Leukocytolysis

Within the blood there is a process not well recognized which is called leukocytolysis. Leukocytes are the white blood cells. More leukocytes, formed in the bone marrow, enter the blood than leave it. The breakdown of the leukocyte within blood plasma, possibly by apoptosis, frees the proteins, amino acid products, polysaccharides, lipids, nucleic acids, all sorts of hormones, oxireductive complexes and other nutrient components as method of nutrient availability to the Interstitial fluid. This, therefore, is a biologic process seldom recognized.

14. Minerals, Trace Minerals and Phytominerals

Minerals are essential for electrolyte balance and normal ionic transfer of nutrients from blood to interstitial fluid and thence to the cell (See Fig. 5) Many cells are dependent on trace minerals often depleted in soils. Phytominerals (having passed through plant or animal life) are available in primitive deposits prior to turning to coal. These can be extricated from humic acids and fulvic acids. Processed to become a base material, they are called Fulvic Base™ (by Morganics, Inc.). This is an important step in the formation and maintenance of bone and joints. Ninety percent of body protein is in the form of collagen, but a most notable source of vital phytocalcium is from the coral in the sea. The body pH is vastly important. For longevity, alkaline water found near a coral sea also can neutralize waste products in the body. Calcium is the number one mineral for health.

15. Probiotics

In the cultural conditions of the modern world, antibiotics destroy good or favorable bacteria together with the bad. Microbes of many kinds are vital to normal digestion. Microbial action is nature's method of biodegradation and cycling wastes. Microbes produce enzymes, which help break down foods for assimilation. The replanting of microbes within the digestive tract is referred to as "probiotics". Good health starts with a good gut.

16. Divine Proportions: More than Esthetics

Divine proportions and gnomonic forms are not by accident. There is a very primitive matrix with a basic polarity. This phenomenon is somehow connected with neurotrophic distribution. It may be connected to vortex energy and the process of implosion. (See Fig. 3 and Fig. 6) It may be energy drawn in rather than radiating outwards. Blood flow is on curves and water or fluids spin. It is a part of nature's law of conservation of energy and tissue.

It is perhaps extremely primitive and stored in the role of earliest formed hyaluronic acid as a basic material for a structured matrix. Together with basic Fibonacci numbers, it is also a natural phenomenon.

Perhaps the whole basis for the physical and chemical world without and within our bodies relates to motion, spin and vortex phenomena. (Fig. 8)

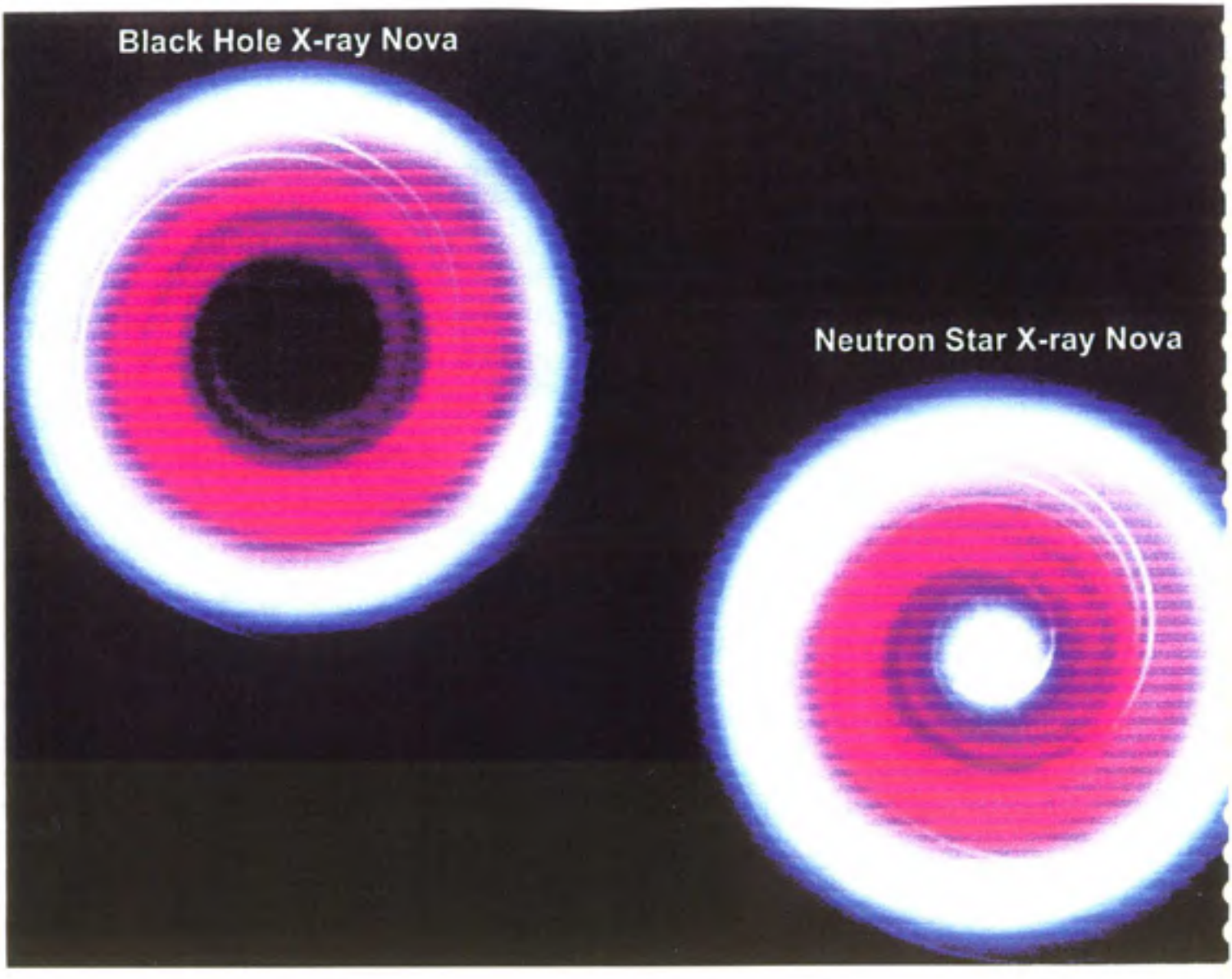


Fig. 6. Understanding implosive and radiant energy leads to better understanding of body mechanisms.

PART II

CLINICAL MOVEMENTS OF SIGNIFICANCE

Basically, clinical orthodontics has two parts. The first, and most fundamental, is the determination of what needs to be accomplished. Here a problem arises because of methods employed for that determination. Further, the knowledge of possibility is essential.

With the coctrine of limitation established in the 1930s, orthodontics became simply the alignment of teeth. Correction of arches was thought to be limited to alveolar process change. If skeletal requirements entered the solution, orthognathic surgery was recommended. However, diagnosis, prognosis and planning of objectives cannot be sophisticated without knowledge of present day mechanics.

Thus, the second part of clinical practice is the "how to" side. We have included twenty different types of apparatus employed considering the major and minor applications. After the technique is mastered and the skill is developed, the determination resolution processes (DRP) become the major challenge.

New clinical movements require learning.

17. Abridged Analysis

Abridgement is a condensed form, which omits the lesser important parts but maintains its contents. Due to the need of students for a more simple starting point, the lateral analyses were scaled down to the "core matrices" and basic factors for reference. This can called an Abridged Analysis or an "Abstracted Analysis".

For the basic skeletal morphology, the Facial Axis (1) is a potent describer of chin position. The Total Facial Height (2) is related by the corpus axis to the basi-cranial axis. The Lower Facial Height (3) is the oral gnomon Ans – X –Pm. Facial Convexity (4) is the distance of point A to the Facial Plane. **(Fig. 7)**

For denture emplacement the Lower Incisal edge (5) is related to the APo Plane and the Upper Molar (6) is related to the PTV Plane. If desired, the Lower Lip (7) is measured from the Esthetic Line.

In extreme dysplasia the palate can be measured from FH Plane.

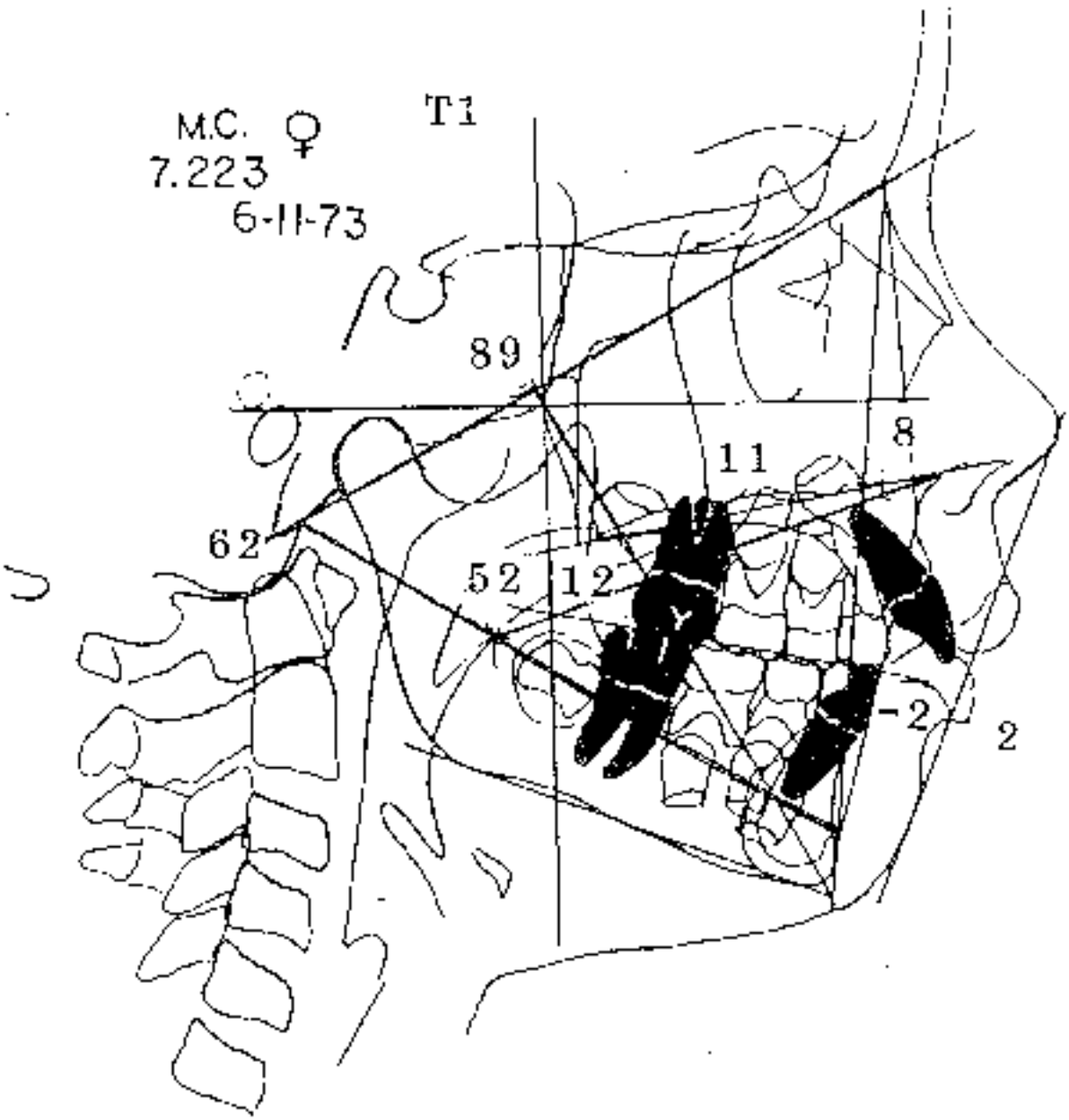


Fig. 7 T1. Female age 7.2. Simple descriptive abridged analysis: Facial Axis, Total Facial Height, Lower Facial Height, convexity, lower incisor, upper molar, *labia inferioris* to E line. Shows Class II overbite with high palatal plane (11° while normal is .2°)

16. Frontal Cephalometrics

Frontal cephalometrics has been a long time in reaching routine clinical usage. It took computer data to develop a practical application. Because no statistically significant correlations (on facial type) could be found with the lateral, a Facial-Mandibular index was determined for assaying frontal facial form.

The level of Nasion was taken from a line through the medial end of the zygomatico-frontal suture (Zf). Menton was used as the lowest border of the chin. Nasion-Menton represents facial height, but the facial mask extends to Trichion at the hairline. Width of the mandible at the region of the molars was registered at the lower border of the trihedral eminence or antegonial tubercle (Ag). The index was determined by way of mandibular width (Ag-Ag) x 100 over the facial height (Nasion-Menton). The adult index is 75 ± 3%. (Fig. 8) Higher indices indicate brachyfacial. Lower numbers indicates dollchofacial.

Transverse data did not lend itself to angular evaluation. Therefore, direct measurements were employed which need to be evaluated by age, sex, type and size. Direct measurements are referred to charts for a starting base. (Chart I) These were: for the nose, the widest point on the inside of the nasal cavity (Nc); for the maxilla, the crossing over of the tuberosity outline with the malar ridge or jugal process (J); for the mandible, the Ag points.

For the teeth, the widest buccal surfaces and canine tips are visible and therefore data was supplied for about 1.0 mm. of enlargement in x-ray images anteriorly and 2.0 mm. at the molars.

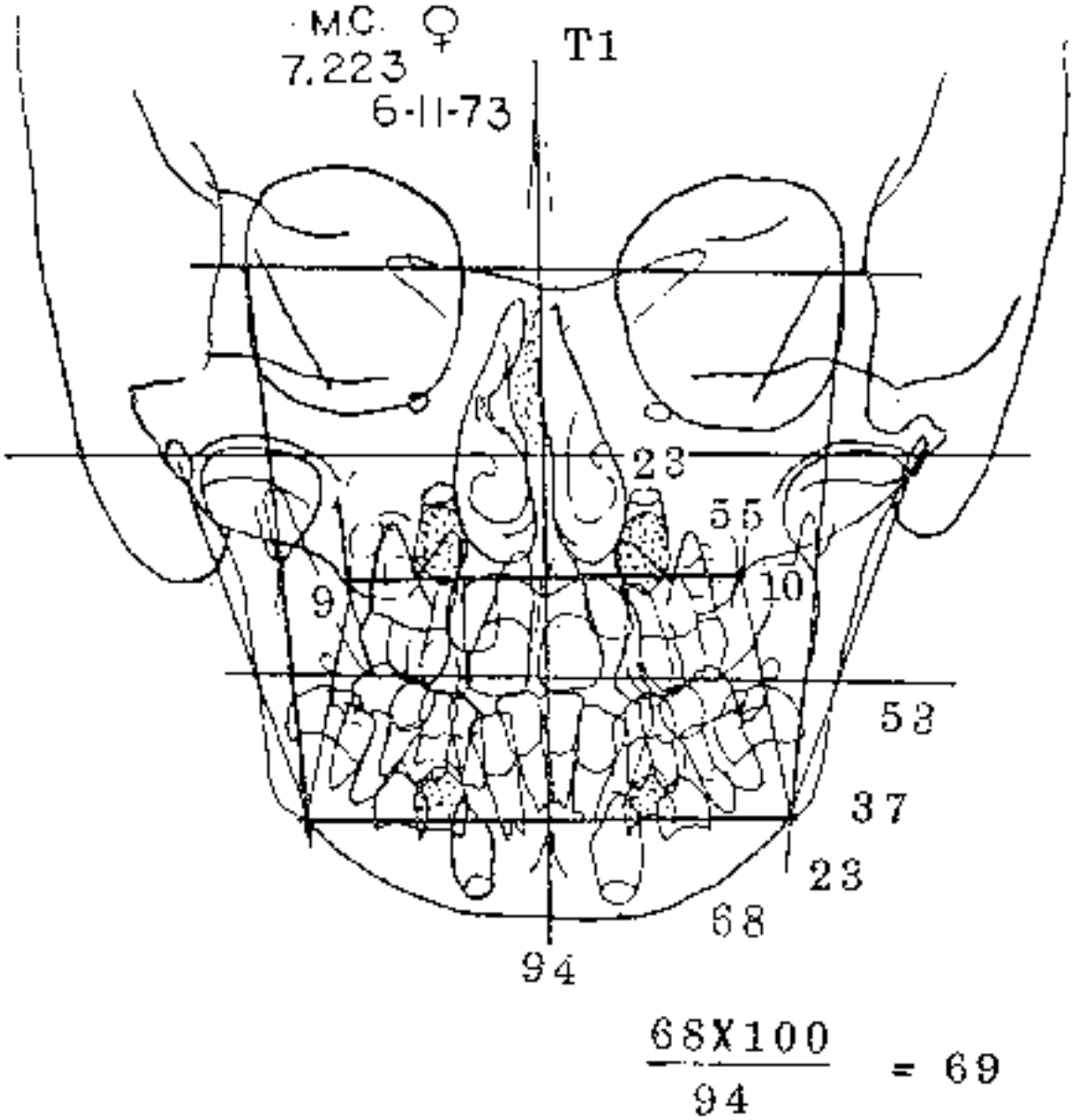


Fig 8.

Frontal view of patient seen in Fig. 7. High deviated septum narrow nasal cavity and maxilla, slightly long face, narrow arches and cephalometric molar cross-bite.

Chart I: Transverse Dimensions

	Nasal	Maxilla	Mandible
	Nc-Nc	J-J	Ag-Ag
Age 3 yrs.	22.0 mm.	55.0 mm.	67.0 mm.
Age 8 yrs.	24.5 mm.	60.0 mm.	74.5 mm.
Age 13 yrs.	27.0 mm.	65.0 mm.	82.0 mm
Age 18 yrs.	29.5 mm.	70.0 mm	89.5 mm.
For Negroid and Mongoloid, add 3.0 mm.			
Typical Growth	0.5 @ yr.	1.0 @ yr.	1.5 @ yr.

The index was the first factor (1).

Measurements from these references were: the widths of the nasal cavity (Nc) (2), maxilla (J) (3) and mandible (Ag) (4) were second. Disagreement is noted by non-parallelism of lines. The distance from J points to the frontal facial plane adds to the information (5 and 6).

The width of the lower denture serves as a foundation. A maximum inter-buccal width of first molar teeth is a reference (7). The upper first molar is related to the lower (8) (9). Widths of the **lower first premolar** were found to be critical to arch form (10). Intercanine width is the last factor. Thus, due to the measurement, on both sides, the frontal abridged analysis, in the end, was more extensive than the lateral. (See Fig. 8)

19. Dentometrics and Pentamorphics

It is ironic that model analysis has led to confusion in the profession. The proclamations of Nance in 1947 were taken as absolute dogma, but they have not stood up scientifically.

In order to correlate denture widths with the face, two sites emerged as key references. The first was the lower first molar widths, which are related to posterior facial factors. Secondly was the lower first premolar, which most signifies arch form. The canine area also reflects the *orbicularis oris* complex.

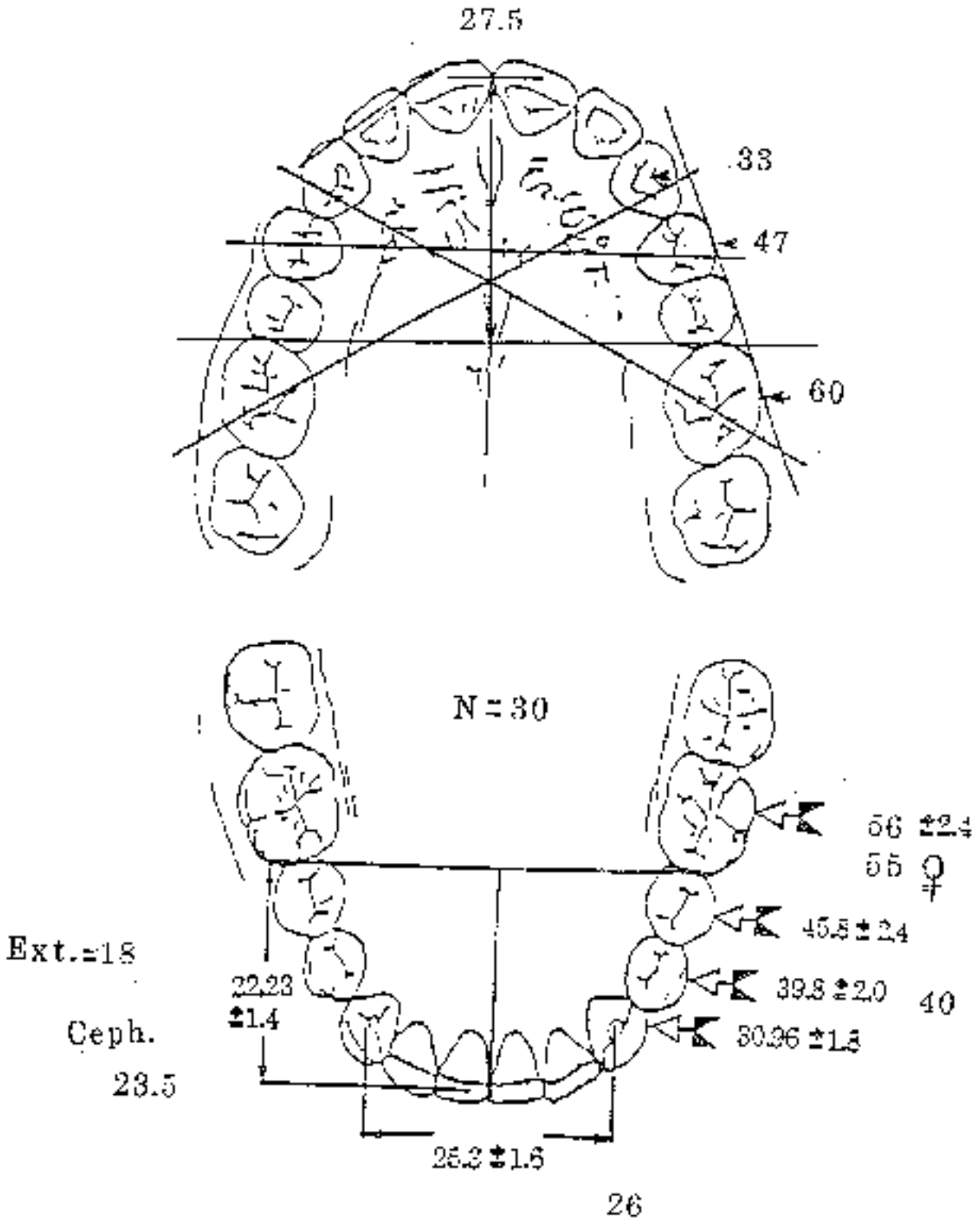
The lower arch is the most critical and is therefore evaluated first, planned first and finished first! The maxillary arch has greater adaptability.

Those two factors being paramount, the maximum dimensions at the most buccal crown widths became critical. Also, the arch wire was placed in tubes or brackets on the buccal side. In addition, the buccal surfaces were more easily identified in the frontal head film. Mean data was obtained together with standard deviations of specific sites in the permanent denture. **(Fig. 9 A)** These were at the widest buccal point on the first molars and first premolars and the canine tips of each arch. Data was further derived for the mixed and deciduous levels of development. **(Fig. 9 B)**

In order to correlate with lateral cephalometrics, the depth of the arch was taken from a line through the mesial contact area of the first molars to the average central incisor edge corrected for asymmetry. (See Fig. 9)

Studies led to a condensing down to **five arch forms** to cover the range of clinical needs. Untreated normal models were used together with 10-year stable treated patients' models for study. The most common as expected was the Normal Arch at 38%. The Ovoid (25%) and Tapered (15%) to follow in frequency. The fourth was the Narrow Tapered shape (12%), and the last was the Narrow Ovoid (10%). **(Fig. 10A)**

By using the arch form projections for the individual patient, the comparison of the actual to the intended permits a visualization for needed expansion at the bracket line. **(Fig. 10 B)**



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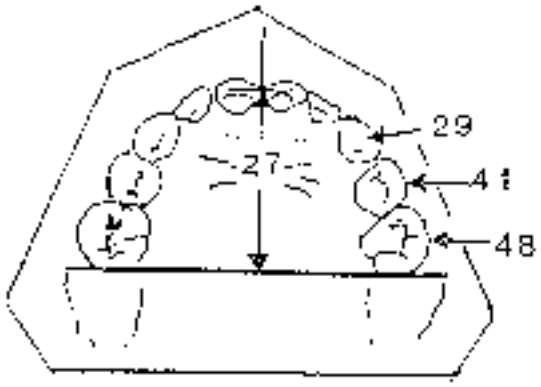
Mean data with standard deviations for measurements at buccal points and arch depth from line through mesial molar contacts.



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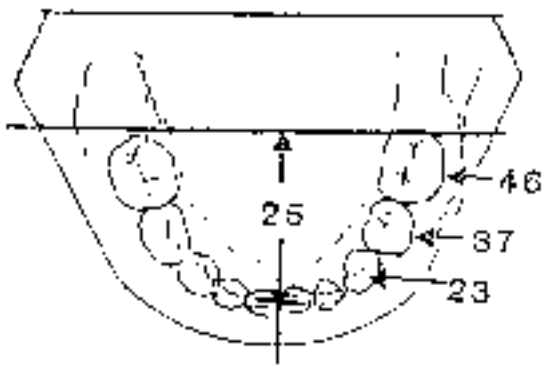
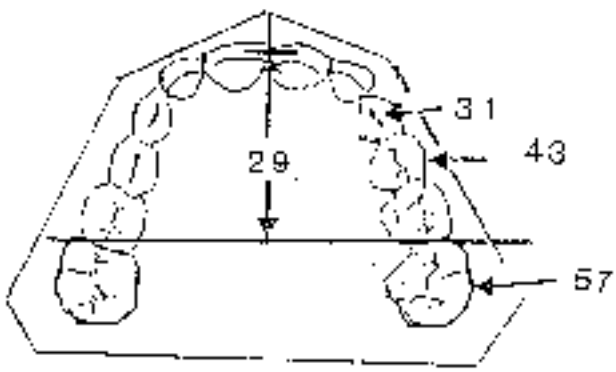


Dimensions rounded out in mm.



MIXED Age 8 Yr.

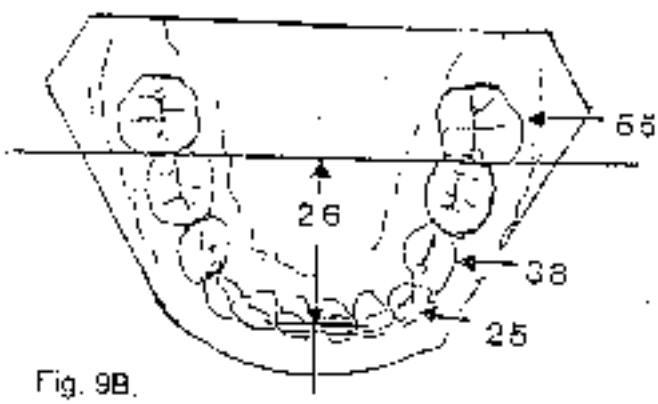


Fig. 9B.

Above: Typical mean measurements of arches of five-year-old child. Terminal line is the distal of the second deciduous molars.

Below: Buccal widths, inter-canine width and arch depth at 8 years in the mixed dentition.

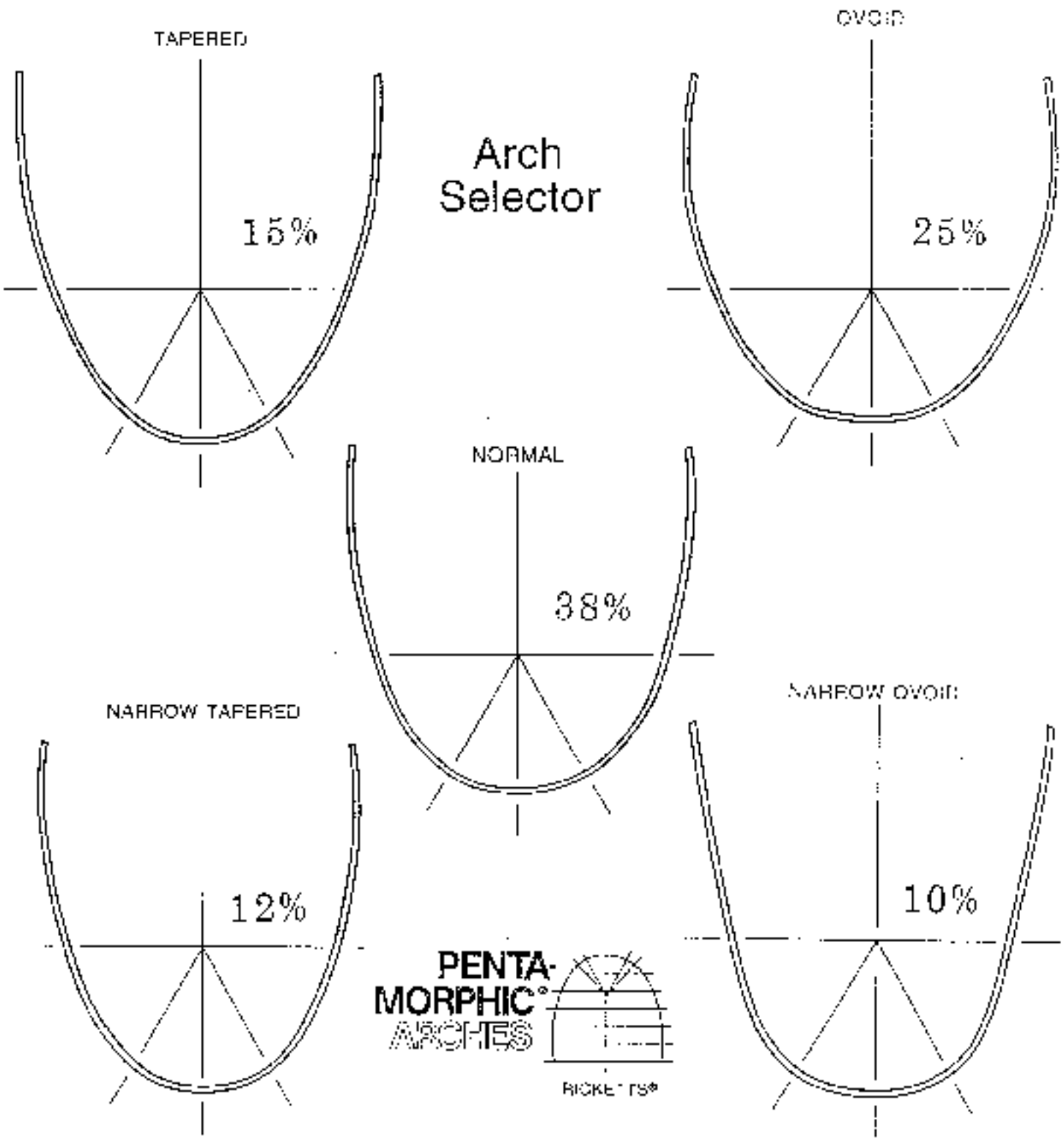


Fig. 10A. The classic five arch shapes with their percentages in the orthodontic population.

G.A. ♂

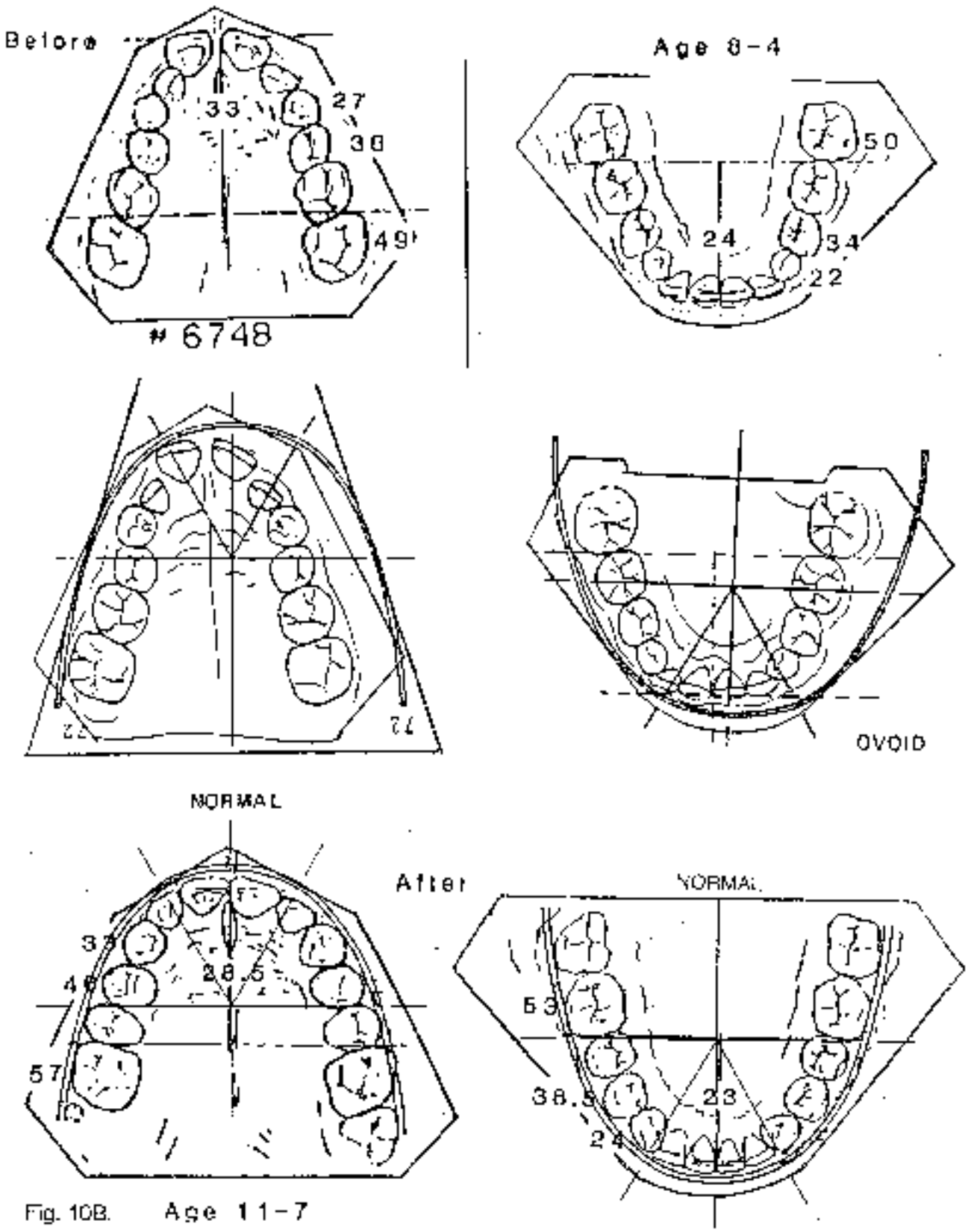


Fig. 10B. Age 11-7

Class II patient G.A. with normal arches compared to original malocclusion showing needed expansion for various forms. He was treated to "normal" form.

20. The Hafting Zone Matrix

The interface between the calvaria and the face lies essentially parallel along a line from Basion to Nasion. **(Fig. 11)** The brain's medulla lies on the clivus, which is the upper part of the occipital-sphenoid strut. The roof of the naso-pharynx is the counter surface in the face. The Ba-N Plane has been called the Basi-cranial Axis. It cuts across the roots of the pterygoid plates and cuts off the base of vomer at the rostrum of the sphenoid. It passes near the exit of the maxillary division of the fifth nerve at *Foramen Rotundum*. It passes in the same direction and near the same Plane as the zygomatico-temporal suture. It transverses directly through the inferior orbital fissure, which separates the great wing of the sphenoid from the maxilla. It cut near the line of junction of the maxilla with the labyrinth of the ethmoid and falls in a line with the junction of the frontal process of the maxilla. Posteriorly, the line cuts just at the border of the tympanic plates.

By all processes of reasoning, **it is a line of separation of the face with the calvaria**. But even further, the use of the Basion-Nasion Plane is **statistically** more appropriate for facial morphologic description.

However, another "hafting" principle is at work in the vertical plane at the region of the coronal suture. A vertical line was dropped perpendicular to the Frankfort plane at the base of the pterygoid plates (Pr), and was called the Pterygoid Vertical (PTV). This line serves as a base line for antero-posterior cranial growth and a reference for horizontal morphology. It is, further, a reference for dental development. (See Fig. 2)

Thus as a junction of **two** hafting zones, a complete cranial base scaffolding is found at the union of two planes: the Basi-cranial Axis anteriorly and the Frankfort plane posterior to PTV. (See Fig. 11)

PART II

CLINICAL MOVEMENTS OF SIGNIFICANCE

Basically, clinical orthodontics has two parts. The first, and most fundamental, is the determination of what needs to be accomplished. Here a problem arises because of methods employed for that determination. Further, the knowledge of possibility is essential.

With the doctrine of limitation established in the 1930s, orthodontics became simply the alignment of teeth. Correction of arches was thought to be limited to alveolar process change. If skeletal requirements entered the solution, orthognathic surgery was recommended. However, diagnosis, prognosis and planning of objectives cannot be sophisticated without knowledge of present day mechanics.

Thus, the second part of clinical practice is the "how to" side. We have included twenty different types of apparatus employed considering the major and minor applications. After the technique is mastered and the skill is developed, the determination resolution processes (DRP) become the major challenge.

New clinical movements require learning.

17. Abridged Analysis

Abridgement is a condensed form, which omits the lessor important parts but maintains its contents. Due to the need of students for a more simple starting point, the lateral analyses were scaled down to the "core matrices" and basic factors for reference. This can called an Abridged Analysis or an "Abstracted Analysis".

For the basic skeletal morphology, the Facial Axis (1) is a potent describer of chin position. The Total Facial Height (2) is related by the corpus axis to the basi-cranial axis. The Lower Facial Height (3) is the oral gnomon Ans – X –Pm. Facial Convexity (4) is the distance of point A to the Facial Plane. **(Fig. 7)**

For denture emplacement, the Lower Incisal edge (5) is related to the APo Plane and the Upper Molar (6) is related to the PTV Plane. If desired, the Lower Lip (7) is measured from the Esthetic Line.

In extreme dysplasia the palate can be measured from FH Plane.

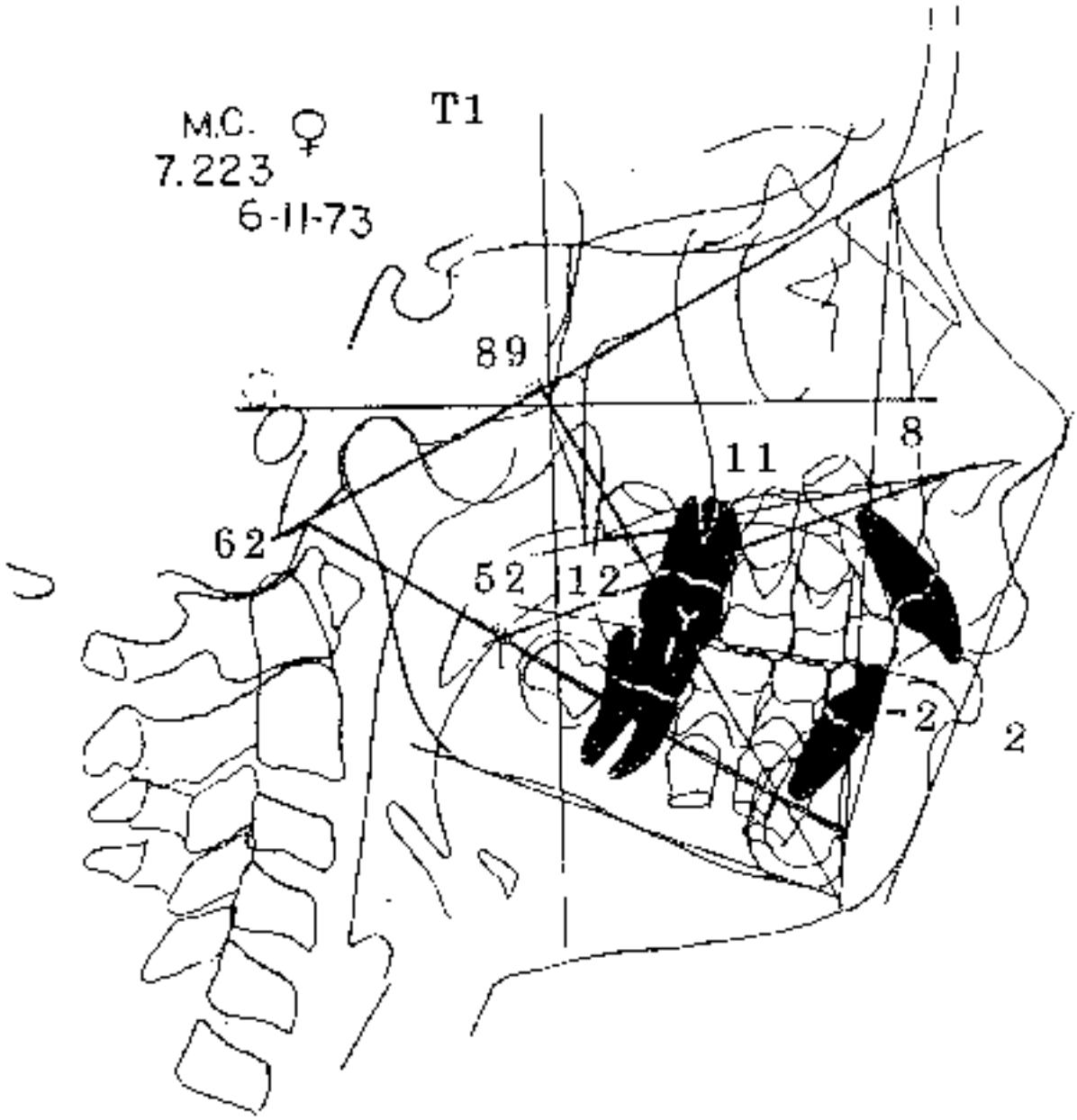


Fig. 7 T1. Female age 7.2. Simple descriptive abridged analysis: Facial Axis, Total Facial Height, Lower Facial Height, convexity, lower incisor, upper molar, *labia inferioris* to E line. Shows Class II overbite with high palatal plane. (11° while normal is 2°)

18. Frontal Cephalometrics

Frontal cephalometrics has been a long time in reaching routine clinical usage. It took computer data to develop a practical application. Because no statistically significant correlations (on facial type) could be found with the lateral, a Facial-Mandibular index was determined for assaying frontal facial form.

The level of Nasion was taken from a line through the medial end of the zygomatico-frontal suture (Zf). Menton was used as the lowest border of the chin. Nasion-Menton represents facial height, but the facial mask extends to Trichion at the hairline. Width of the mandible at the region of the molars was registered at the lower border of the trihedral eminence or antegonial tubercle (Ag). The index was determined by way of mandibular width (Ag-Ag) x 100 over the facial height (Nasion-Menton). The adult index is 75 ± 3%. (Fig. 9) Higher indices indicate brachyfacial. Lower numbers indicates dolichofacial.

Transverse data did not lend itself to angular evaluation. Therefore, direct measurements were employed which need to be evaluated by age, sex, type and size. Direct measurements are referred to charts for a starting base. (Chart I) These were: for the nose, the widest point on the inside of the nasal cavity (Nc); for the maxilla, the crossing over of the tuberosity outline with the malar ridge or jugal process (J); for the mandible, the Ag points.

For the teeth, the widest buccal surfaces and canino tips are visible and therefore data was supplied for about 1.0 mm. of enlargement in x-ray images anteriorly and 2.0 mm. at the molars.

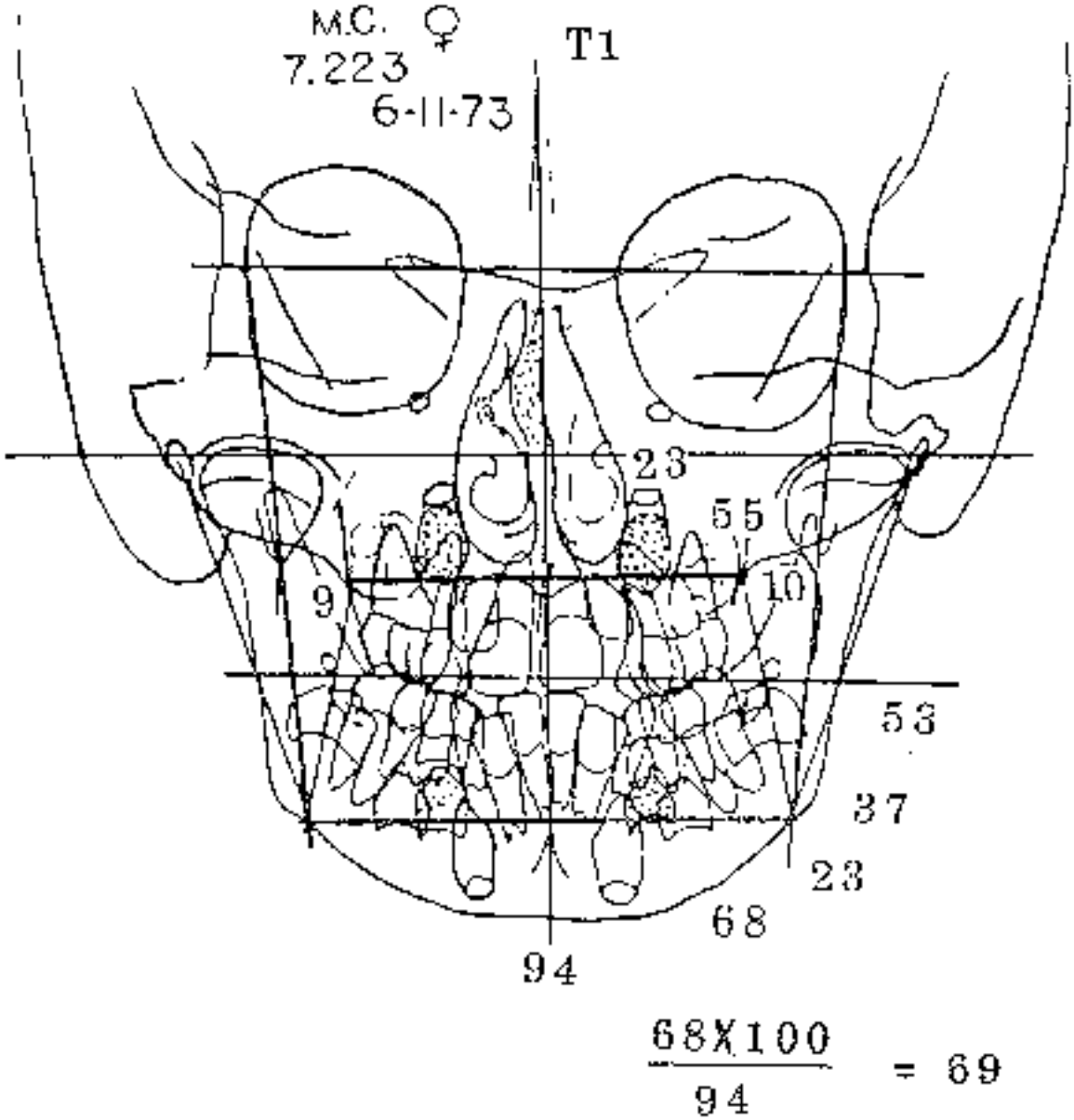


Fig. 8.

Frontal view of patient seen in Fig. 7. High deviated septum, narrow nasal cavity and maxilla, slightly long face, narrow arches and cephalometric molar cross-bite.

Chart I: Transverse Dimensions

	Nasal	Maxilla	Mandible
	Nc-Nc	J-J	Ag-Ag
Age 3 yrs.	22.0 mm.	55.0 mm.	67.0 mm.
Age 8 yrs.	24.5 mm.	60.0 mm.	74.5 mm.
Age 13 yrs.	27.0 mm.	65.0 mm.	82.0 mm
Age 18 yrs.	29.5 mm.	70.0 mm.	89.5 mm.
For Negroid and Mongoloid, add 3.0 mm.			
Typical Growth	0.5 @ yr.	1.0 @ yr.	1.5 @ yr.

The index was the first factor (1).

Measurements from these references were: the widths of the nasal cavity (Nc) (2), maxilla (J) (3) and mandible (Ag) (4) were second. Disagreement is noted by non-parallelism of lines. The distance from J points to the frontal facial plane adds to the information (5 and 6).

The width of the lower denture serves as a foundation. A maximum inter-buccal width of first molar teeth is a reference (7). The upper first molar is related to the lower (8) (9). Widths of the lower first premolar were found to be critical to arch form (10). Intercanine width is the last factor. Thus, due to the measurement, on both sides, the frontal abridged analysis, in the end, was more extensive than the lateral. (See Fig. 8)

19. Dentometrics and Pentamorphics

It is ironic that model analysis has led to confusion in the profession. The proclamations of Nance in 1947 were taken as absolute dogma, but they have not stood up scientifically.

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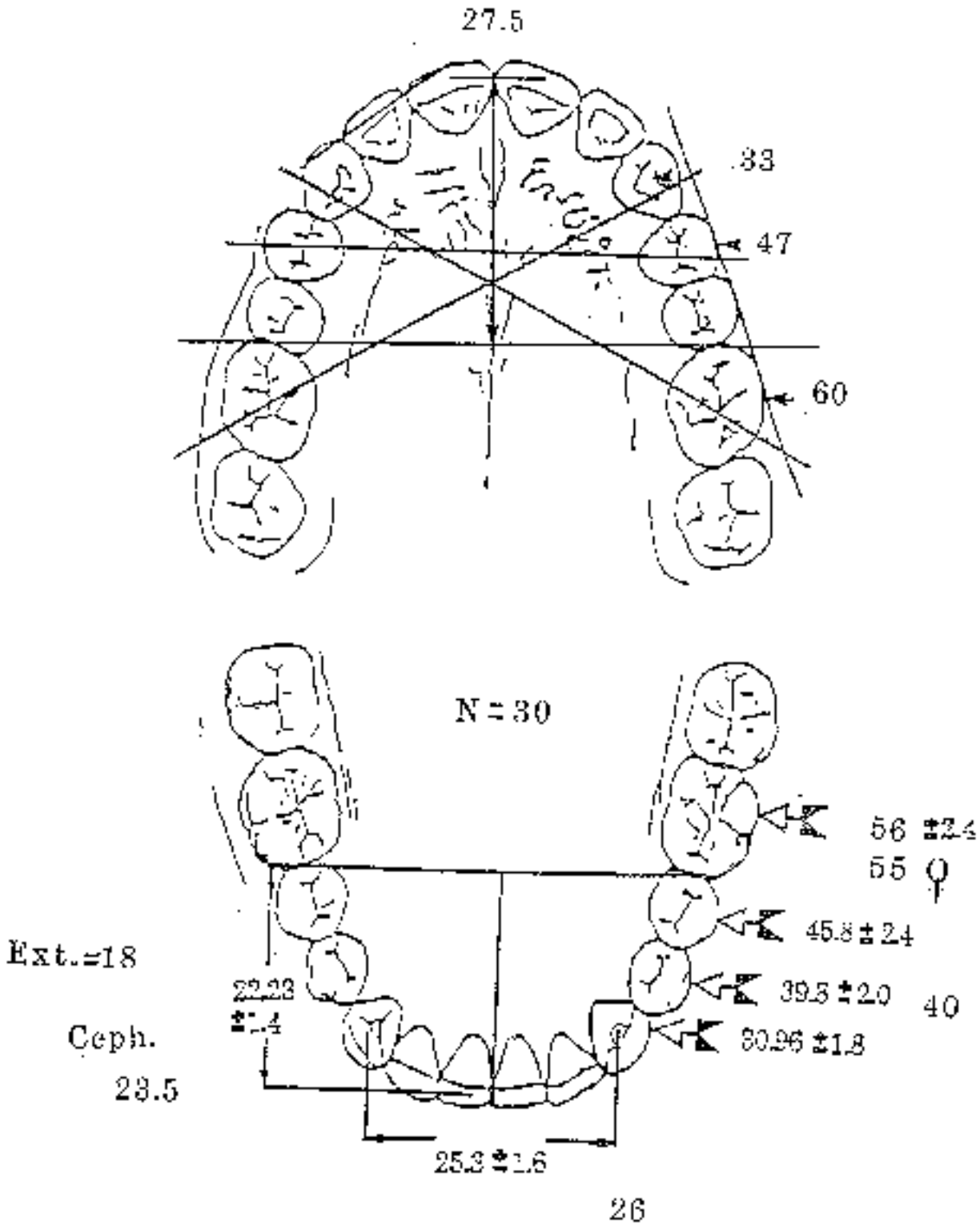

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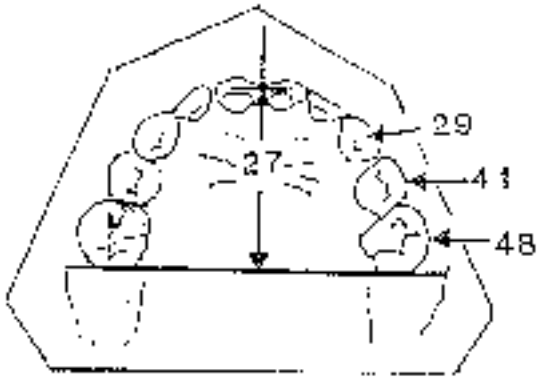

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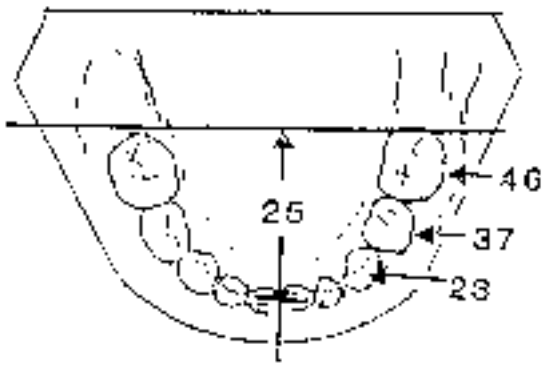
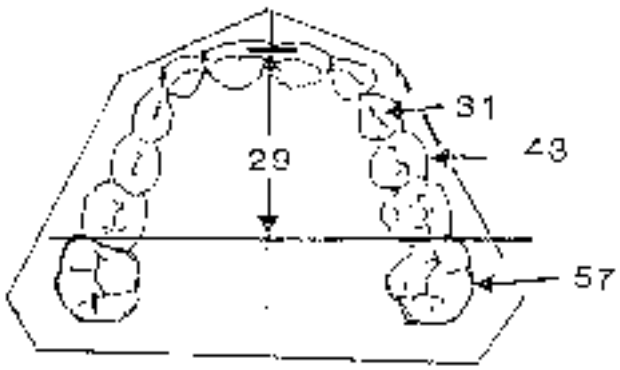
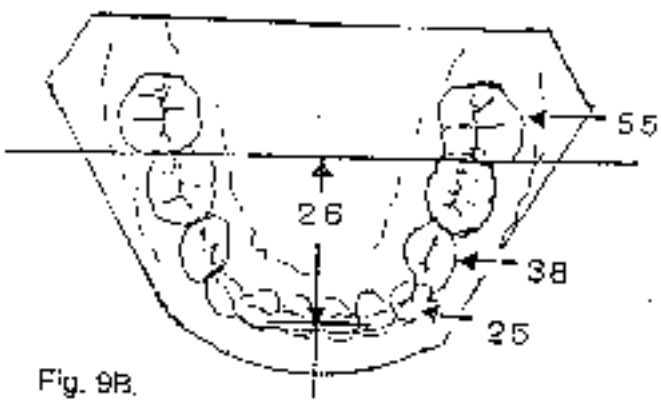


Dimensions rounded out in mm.



MIXED Age 8 Yr.



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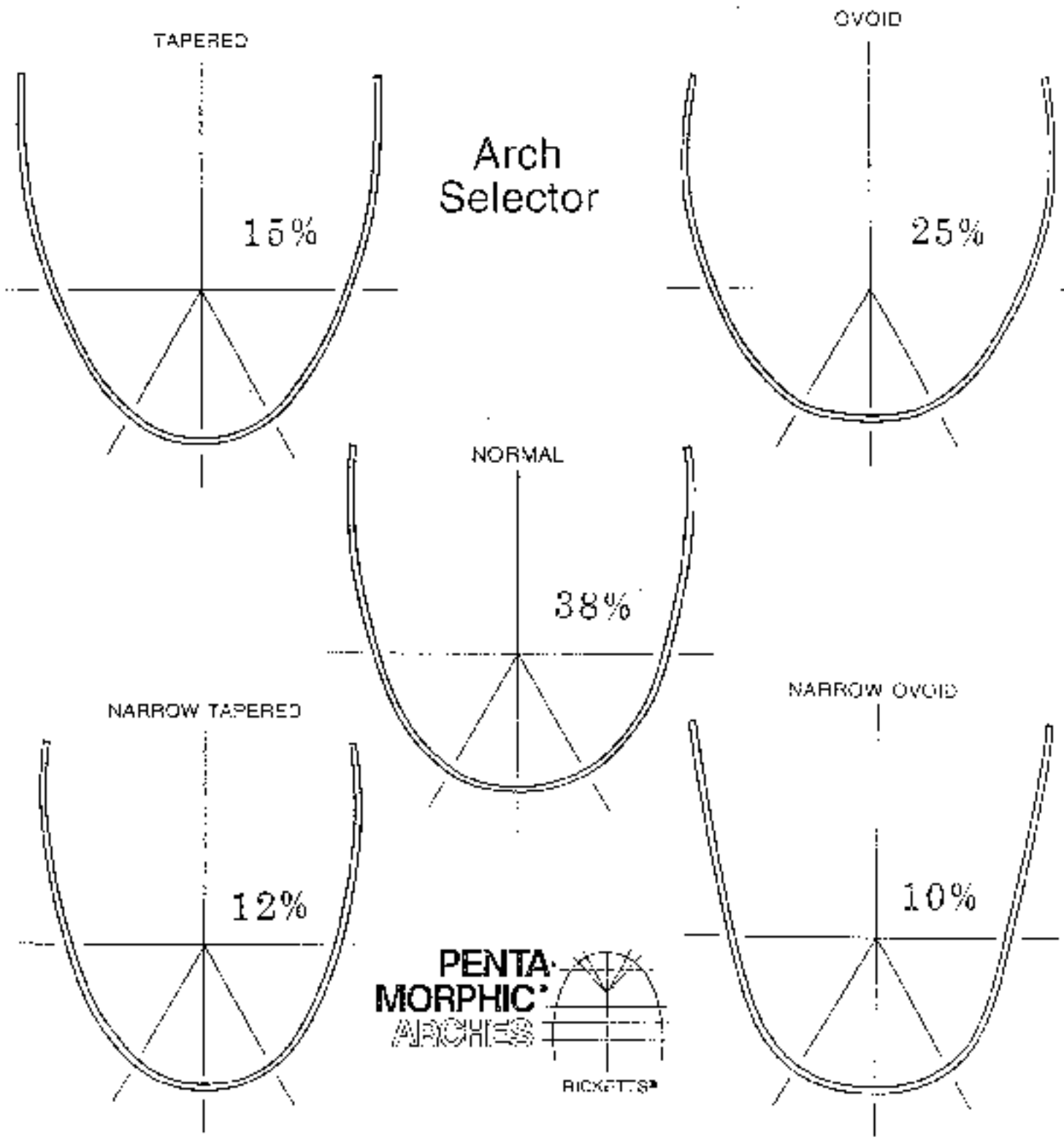

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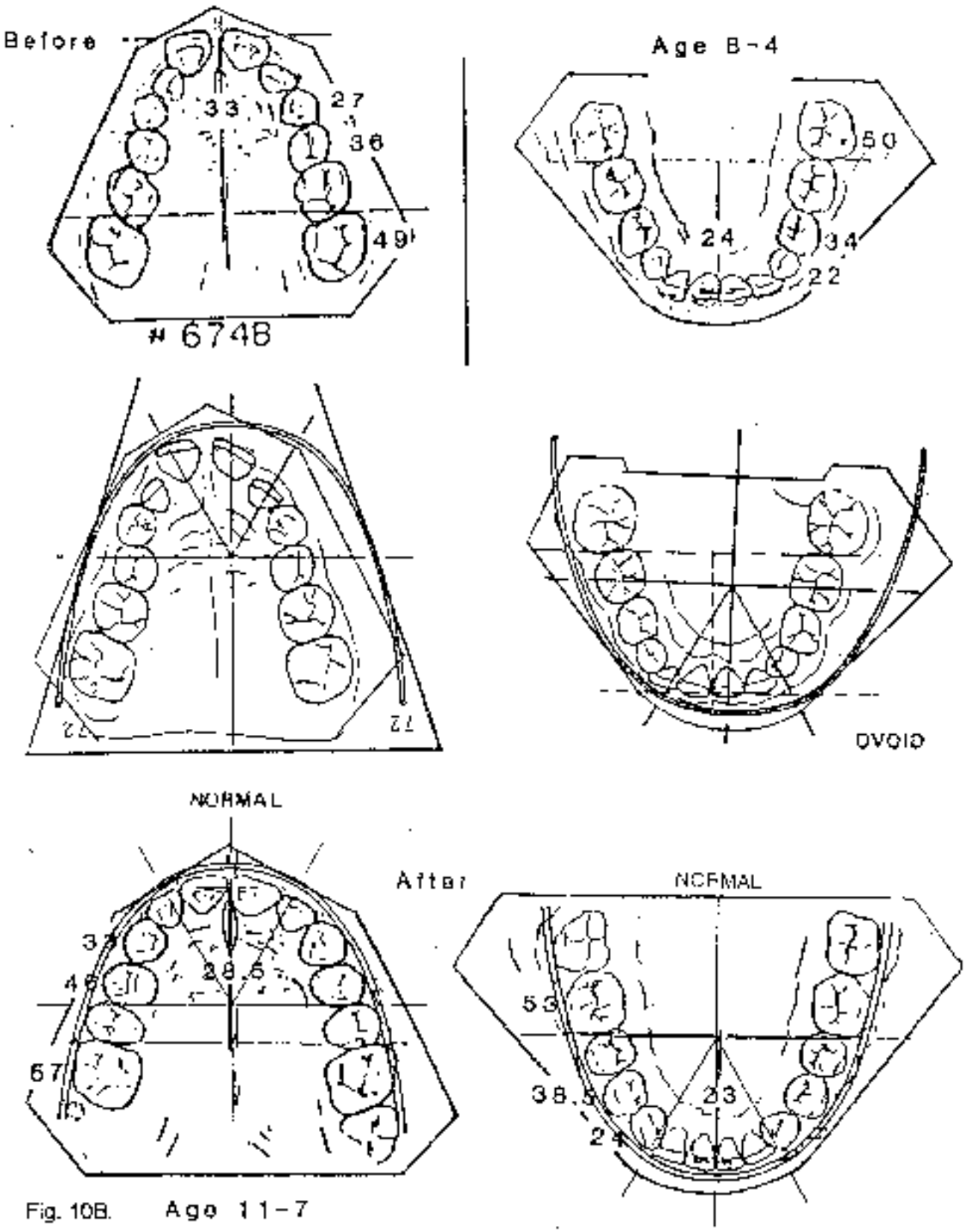

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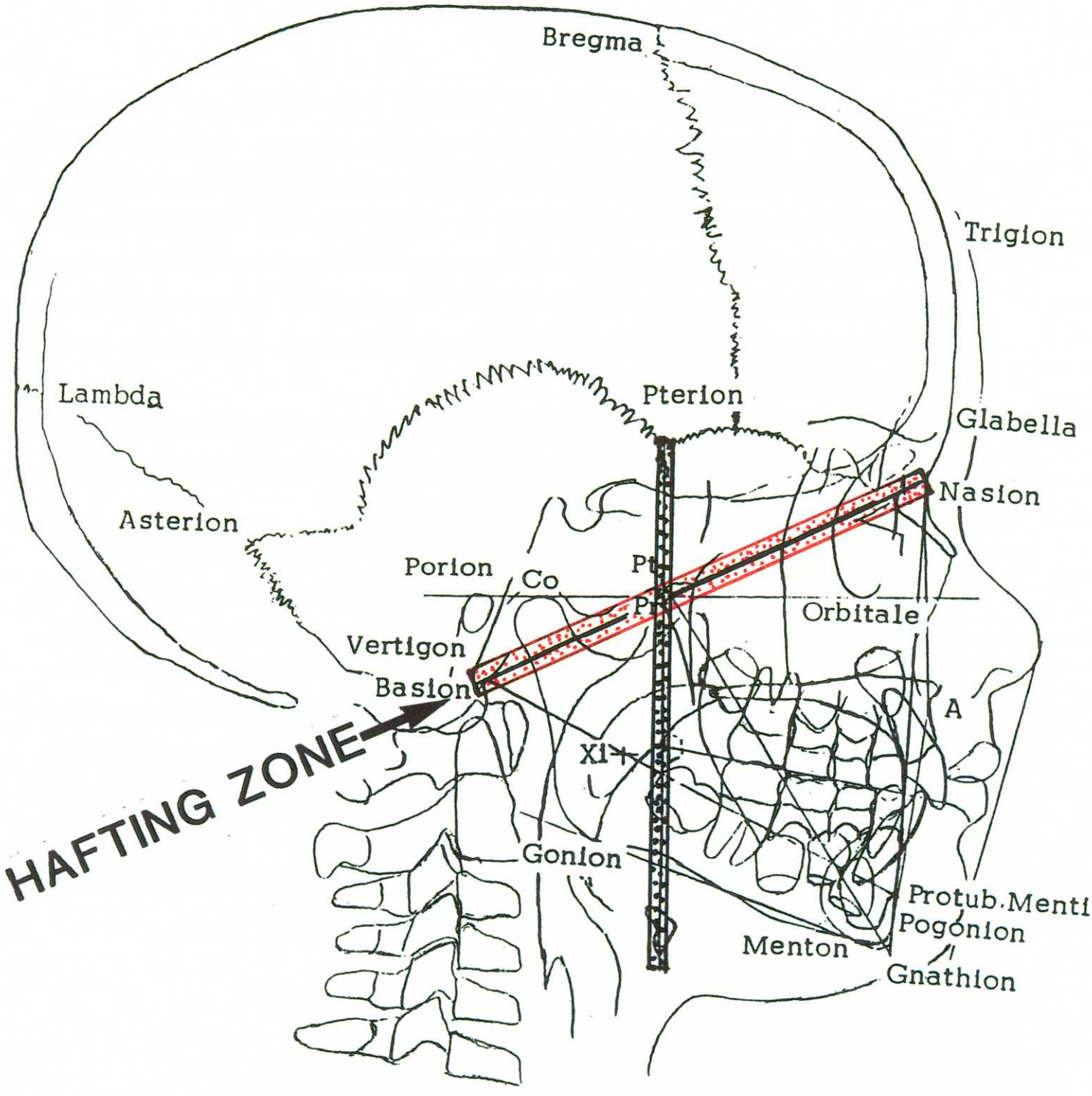


Fig. 11. Logic of the Basion-Nasion Plane as a calvaria-facial interface. Red is Basi-Cranial Axis. Green is Pterygoid Vertical representing Coronal Suture Plane.

21. The Curve of Mandibular Growth

Older concepts held that the mandible grew upward and backward. Computer composites of 90 untreated subjects, however, verified that the mandibular core bent upward and forward with natural growth. Mean data and standard deviations were determined for growth from the X point. Further analysis led to the discovery of a common curve located not through the condyle but **through the center of the base of the coronoid process** starting at Protuberance Menti Pm **(Fig. 12)** Variations were natural, but the basic curve was an individual marker.

It became an issue to determine the behavior of the individual processes from this curve. As this method was compared to implant studies, it was actually found to be superior to the implants for forecasting.

Instead of superimposing on Menton and the lower mandibular border, superimposition on Pm and Rr points revealed true growth behavior much more succinctly. When all growth phenomena was put together, it revealed that the lower denture erupted upward and forward and that no resorption or very little change occurred at the anterior border except in rare pathologic instances. This led to a whole new concept of tooth eruption, occlusal plane management and anchorage. The findings led further to new methods for long range forecasting. **(Fig. 13)**

Finally, it is to be remembered that the mandible grows outward as it grows upward, **(Fig 14)** Condyle arrest limits lateral growth also.

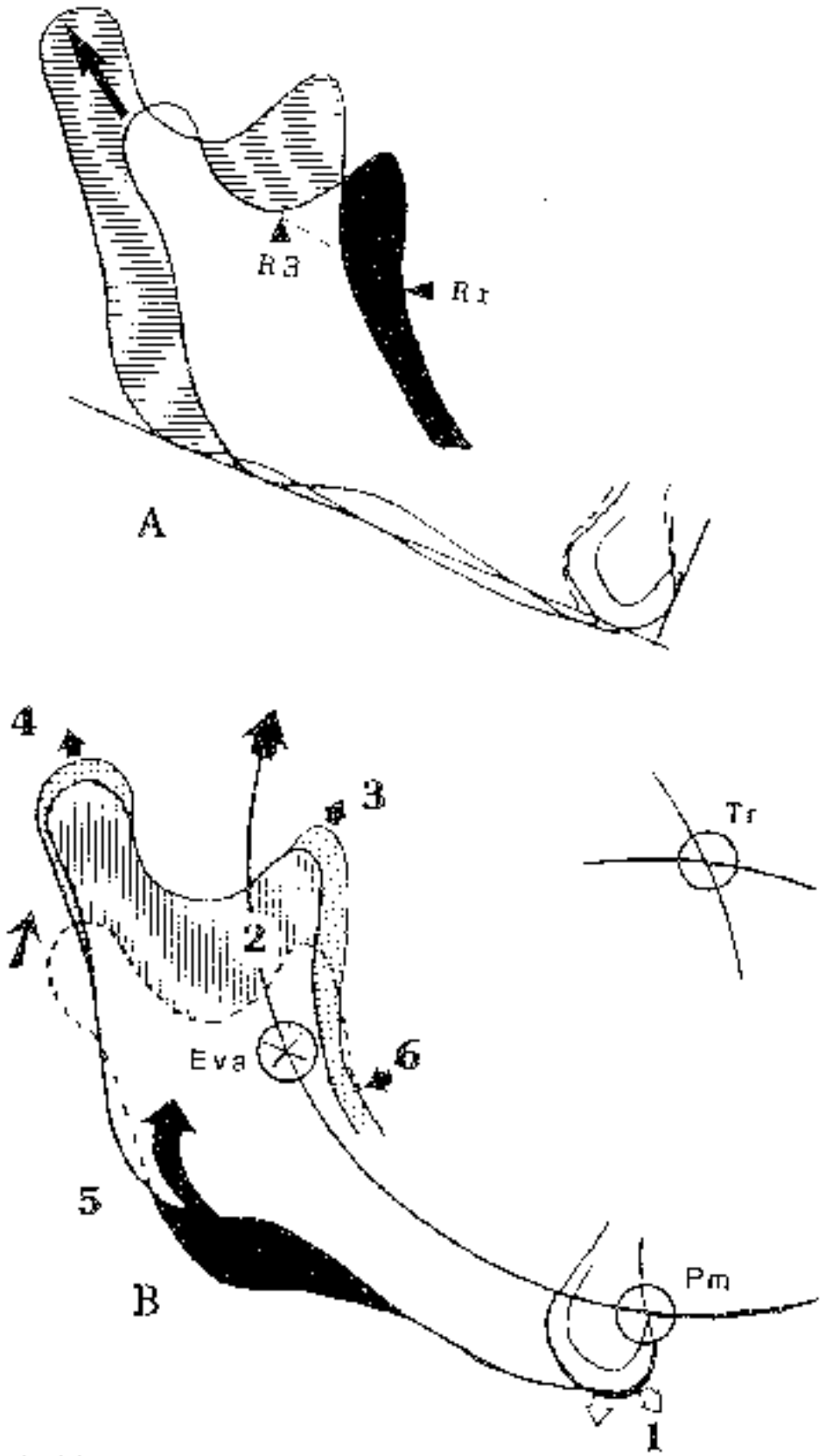


Fig. 12. A. The traditional concept of growth hold that upward and backward ramal growth was characterized by anterior ramal resorption. (See Fig 15 for Eva)
B Studies led to discovery of a curve constructed from Eva Point and the Pm Point distance for this radius (1971). Six sites are modified with growth on the curve

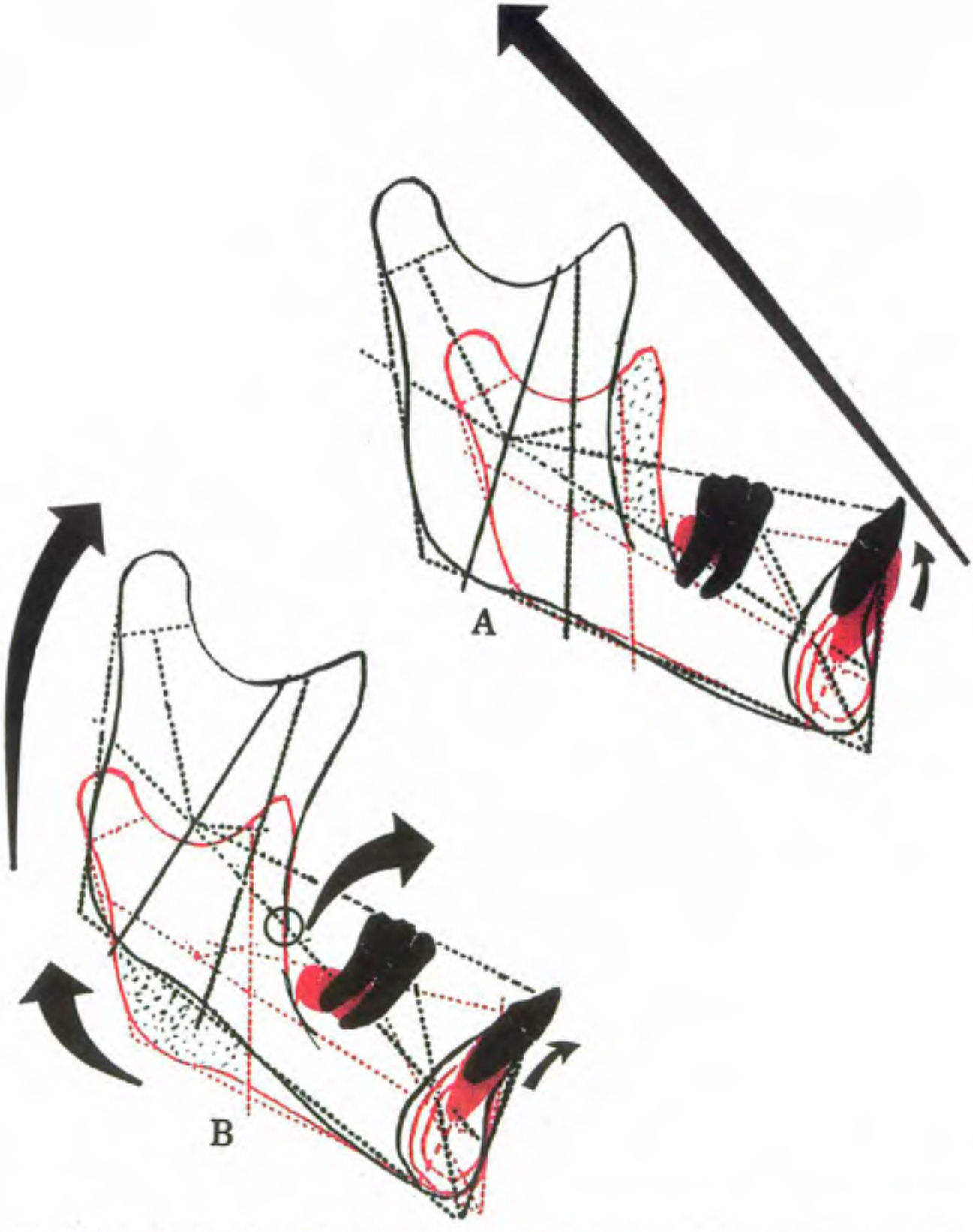


Fig. 13. Re-verification of curve from computer generated components of N=73 children. Difference in eruption of teeth are shown as dependent on method of superimposing Point Rr. Site on the Ramus at age six became part of body of mandible at age 16 years on external oblique ridge (circle).

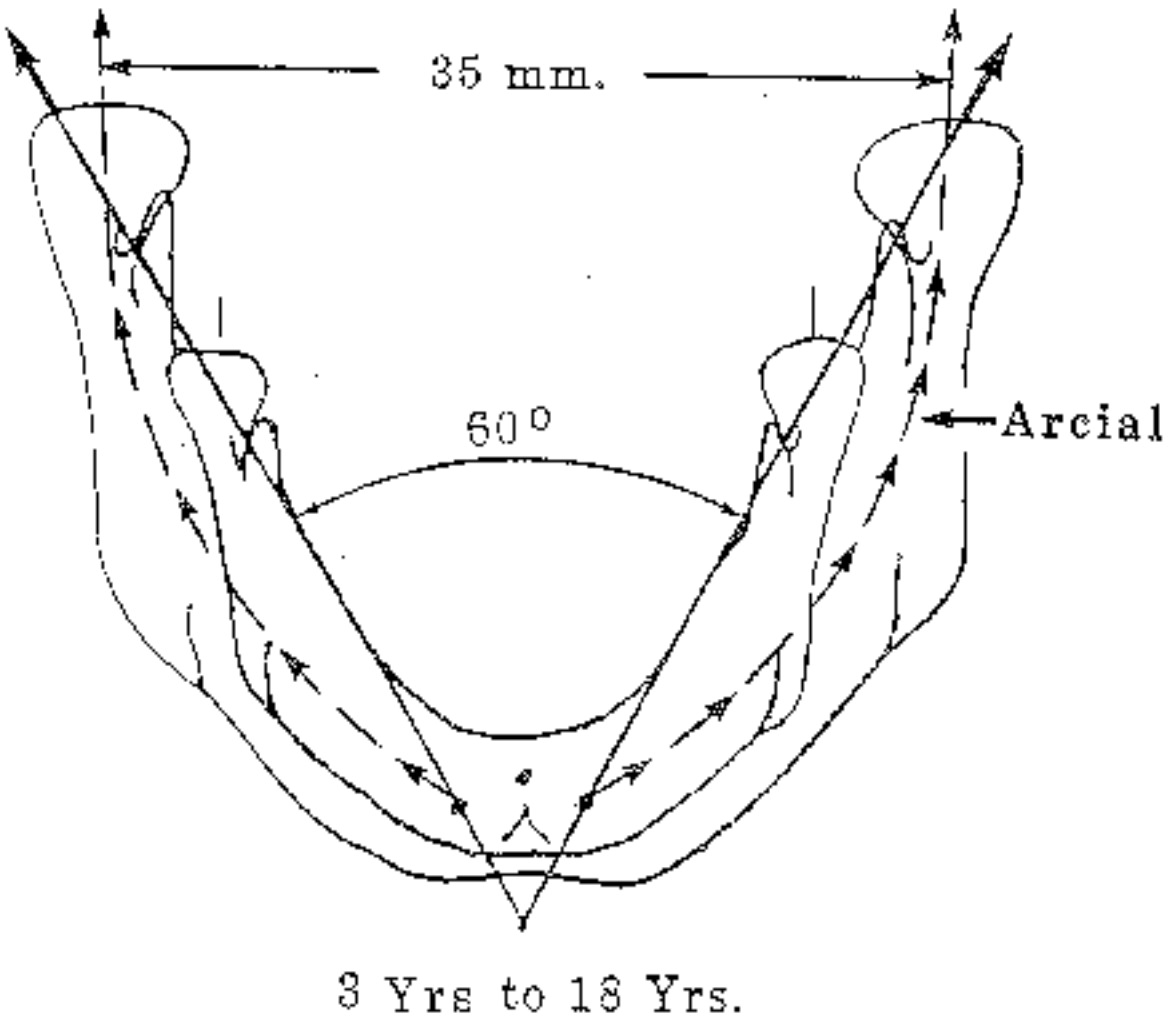


Fig. 14. Arc curve of growth simulated in Frontal Plane. Note the average width dovefopment at 60° angle.

22. Forecasting and Objectivism: Short and Long Term

It is strange that the whole idea of prognosis or forecasting together with treatment designing put down on paper have met with such disfavor and ridicule. Educators and clinicians, however, appear to be so overwhelmed with variation and the tails of the curve of distribution that they fail to respect the enormous central tendency and mainstream. Possibly due to older methods of superimposing, they may not try to recognize the signals and signs of predictable change from a pattern when they are obvious. Another reason for reluctance is that they fail to identify iatrogenic phenomena and misinterpret produced changes as natural growth changes.

Statistics show that 7.0% of children will outgrow Class II malocclusion during the transitional growth changes. On the other hand, about 30% will worsen, particularly when deep bites are present but also with continued oral malfunction. It would seem logical that clinicians would have an interest in the state of the art available to help distinguish differences in 40% of a practice. Further, many clinicians may reject any attempt to treat those patients doomed to worsen if not to correct patients that will not change.

It has been observed that many teach or consider cephalometric analysis to be the last word in diagnosis. But descriptive analysis is only the first step in the determination resolution process. The construction of a visualized treatment objective in the usual two-year time frame (or VTO) may be considered too complicated for the student to grasp. Even considered more groundless is the forecast to maturity with long-range goals to maturity rendered in the VTG.

As another aspect to the problem in the profession, graduate teachers are not available to supervise the forecasting and designing learning process. Yet students assigned the task on a cold basis have mastered the work in only a few hours. Without exposure to the facts, the student therefore is content to

avoid the process altogether. In actual practice commercial aid is available via the computer, but to seek that information seems to be a political embarrassment.

Forecasting with treatment designing in the long range technique consists of essentially five parts. Each part can be learned separately and then connected.

The first order is the facial growth of the mandible followed by the carry over of reference lines such as the occlusal plane and oral gnomon. (See Fig. 12 & 13)

The second is the extension of the hafting zone references according to age, sex and morphology and perhaps with treatment. **(Fig. 15)** Without treatment the BaN point A angle is indeed almost a constant.

The third is the intent of modification of the mid facial components. The hard palate can be manipulated and convexity changed.

The fourth is the most desirable or feasible emplacement of the teeth.

The fifth and final is the growth and treatment modification of the soft tissue profile.

Two books were written as basic reference for the details. The statement was made. Accuracy is far beyond that required for practical value. When the actual varies greatly from the VTG, the procedure becomes diagnostic.

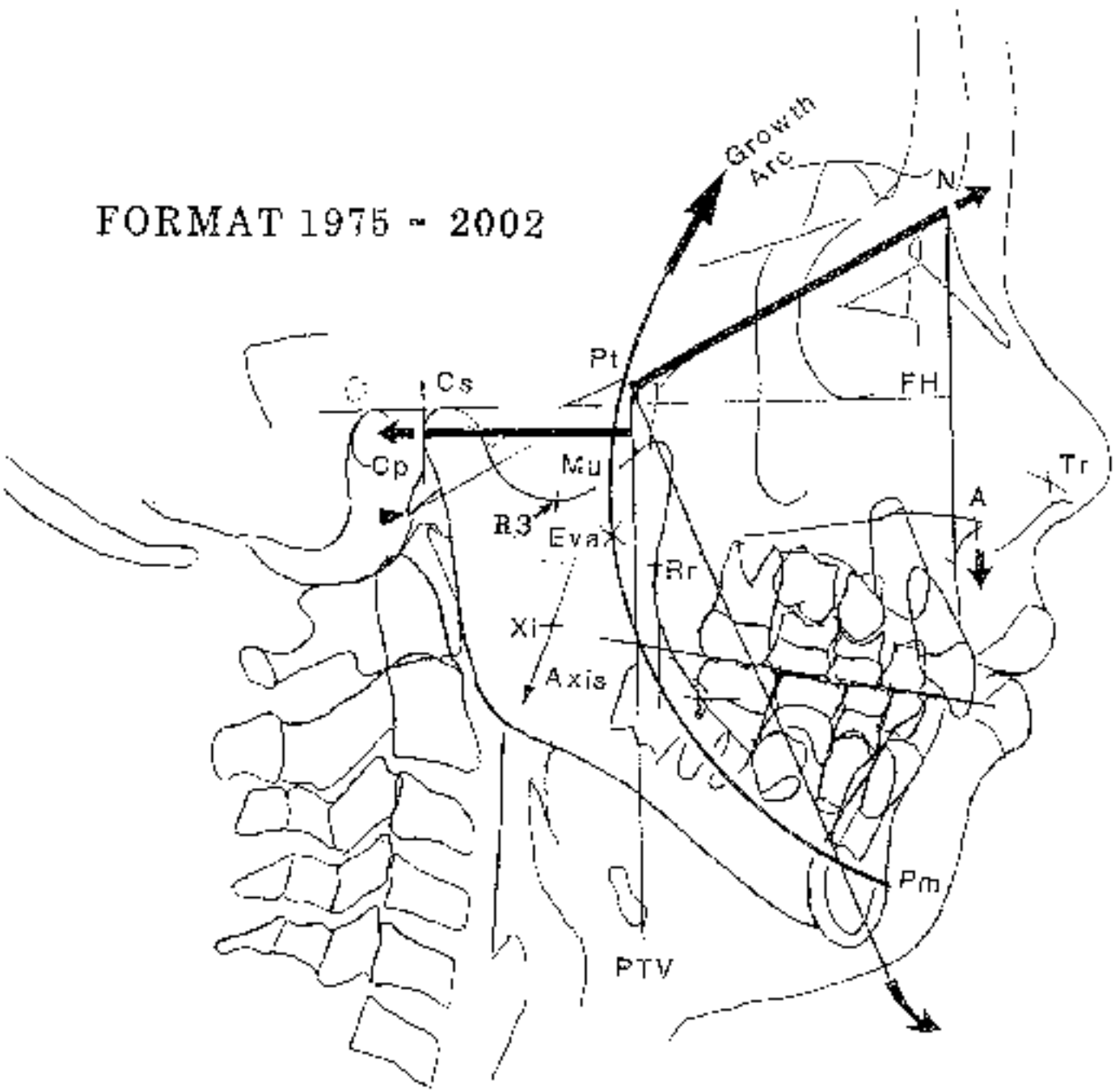


Fig. 15. The heavy lines represent clinically the anterior and posterior cranial bases. Point Eva is located by bisecting the distance from R3 to Rr point. The crossing of the arc on the sigmoid notch was labeled point Murray (Mu).

Third Molars

Another controversy, still boiling, is the idea of forecasting space for lower third molars. Proof of its validity showed a 95% accuracy. Ironically, data suggests that orthodontists save only about 16% of third molars. **But a prediction exercise leads to the preserving of almost 50%.** Thus, contrary to common opinion, the forecast leads to a much more conservative approach even though about 30% of a mixed dentition (age 8.5 years) population can benefit from germectomy. **(Fig. 16A & B)**

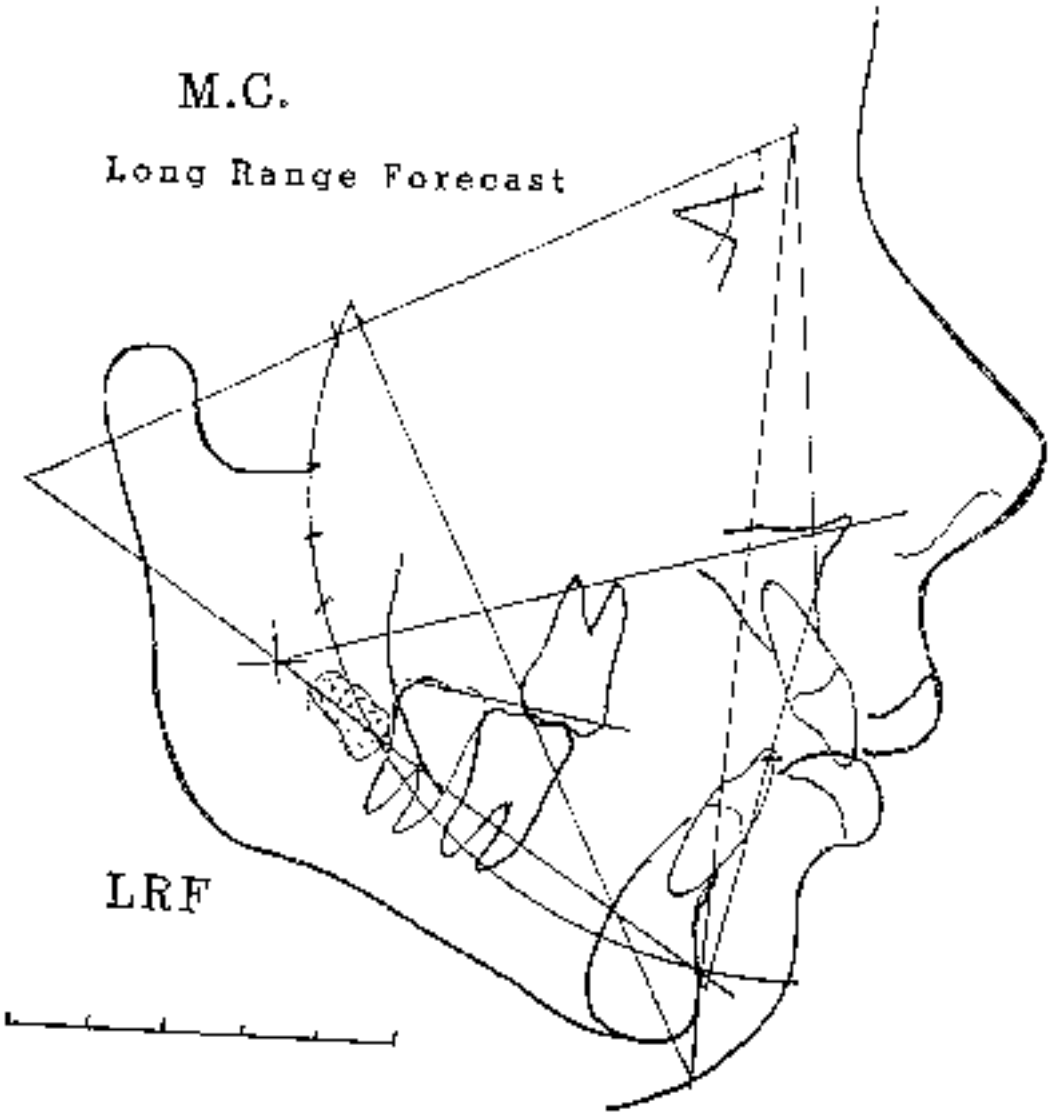


Fig. 16A. Long range forecast without treatment for patient M.C. (seen in Fig. 7).

23. Treatment Designing and Maxillary Adaptivity

One of the greatest controversies to emerge in clinical orthodontics concerns the alterability of the maxilla. Changes invoke a three dimensional concept which may be difficult to understand. Few argue the fact that palates can be split or undergo rapid disjunction. With the facemask in the young growing child, no one doubts that a maxillary complex can be moved forward, and quite rapidly. But for peculiar paradoxical reasons, the idea of retraction or even the holding of a maxilla backward has met with rejection. The same idea has prevailed with tooth intrusion. These factors prompt some explanation.

Sutures have adaptive bone on both sides while the tooth membrane has bundle bone on one side only. In addition, in the region of the pterygoid plates, a double suture is present giving rise to four layers of bundle bone change possibility. Also, the sutures lie at oblique angles. Even further, during maxillary rotation with cervical traction using anchorage on the molar alone, certain of the sutures are slipped and others are disjoined!

Evidence upon more evidence points to the passive functional nature of the mid-facial complex. This indicates that the maxillary complex should be the principle target for correction. This applies both to the short and the long range. This has been proven by statistical data. **(Fig. 16 A & B)**

Of even greater noteworthiness to clinical application is that the nose structure together with the superior lip muscles are attached to the basal maxillary skeletal parts. If that structure is transformed, the ultimate result is a difference in the nose position in the face from where it would have been without treatment. Thus, **total facial esthetics becomes the goal**, not just the teeth and the smile. Reasons for the reluctance to accept this possibility doctrine is that conventional treatment starts much too late and, further, the techniques are poorly understood and therefore are not applied. **(Fig. 17 A, B, C & D)**

AGE: 7.2
MODULES: 2.1
ARC METHOD: 7.1

TREATMENT OBJECTIVE ANALYSIS

MAGGIE COSTIGAN

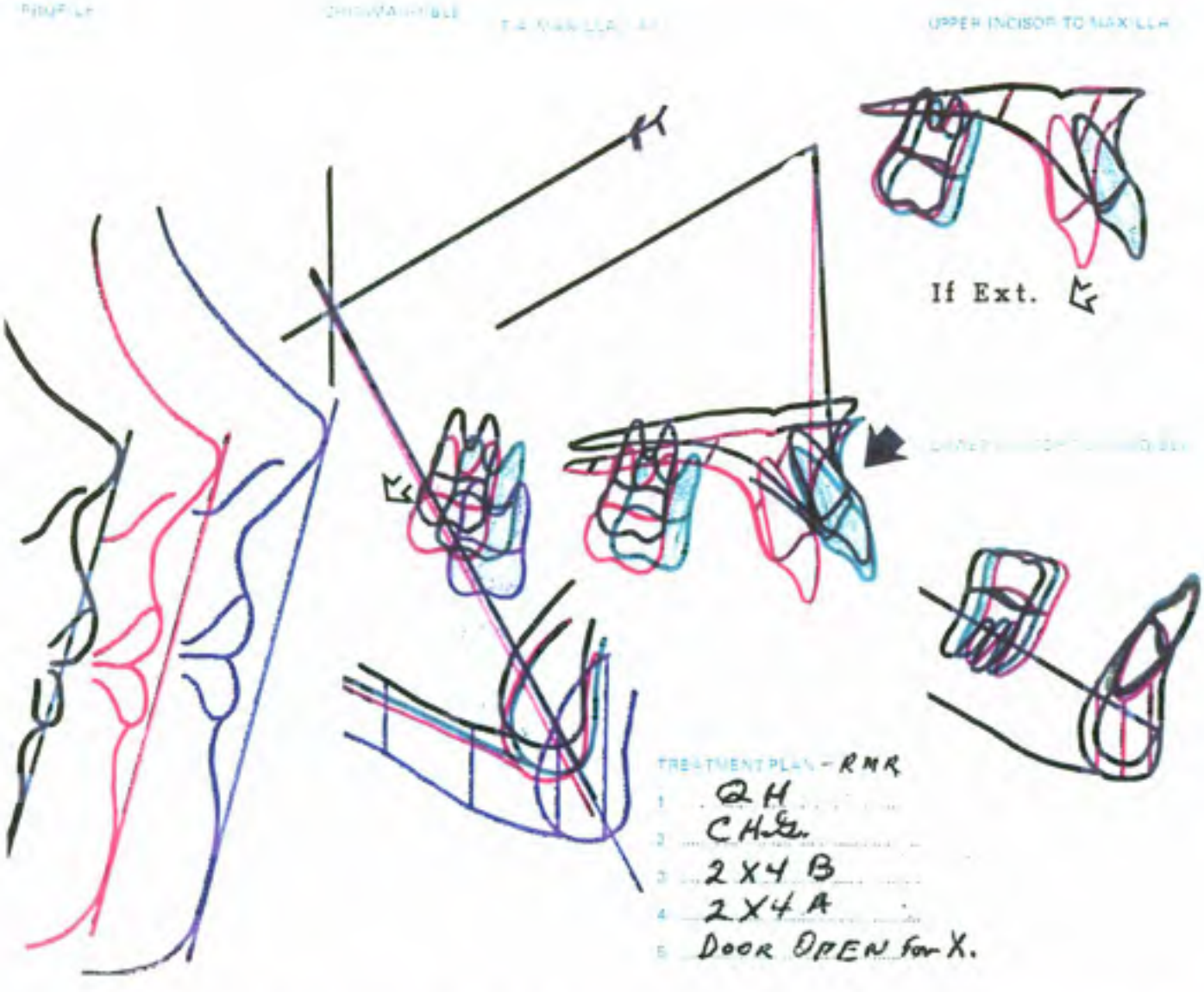


Fig. 16B. RMO Data System work-up of patient M.C., 1972. In order to reduce the incisors the amount required, extraction would be indicated. Greater orthopedics and molar distalization was attempted to avoid extraction.

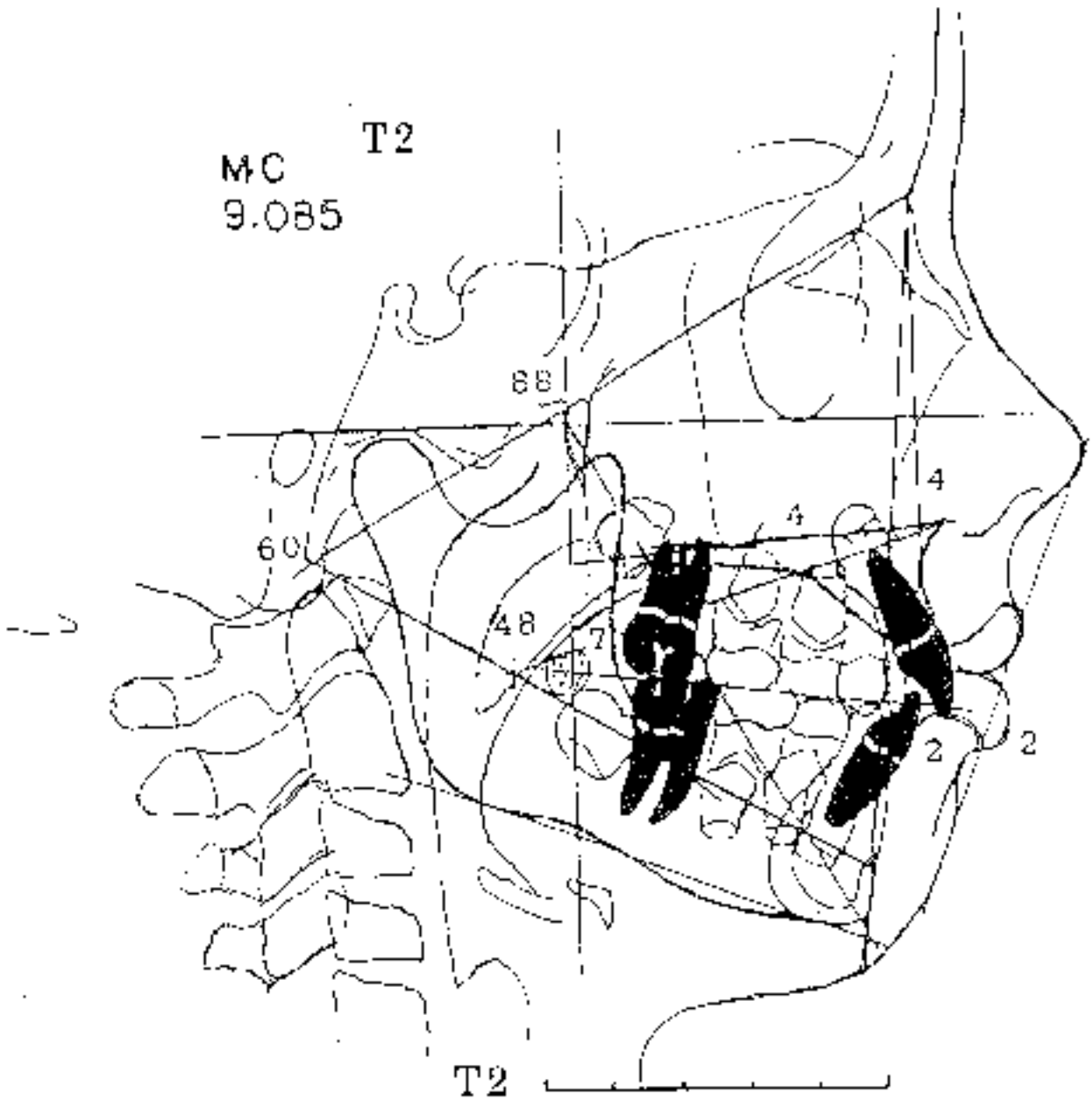


Fig. 17A. Lateral. Tracing after first phase treated. Note the remarkable maxillary change.

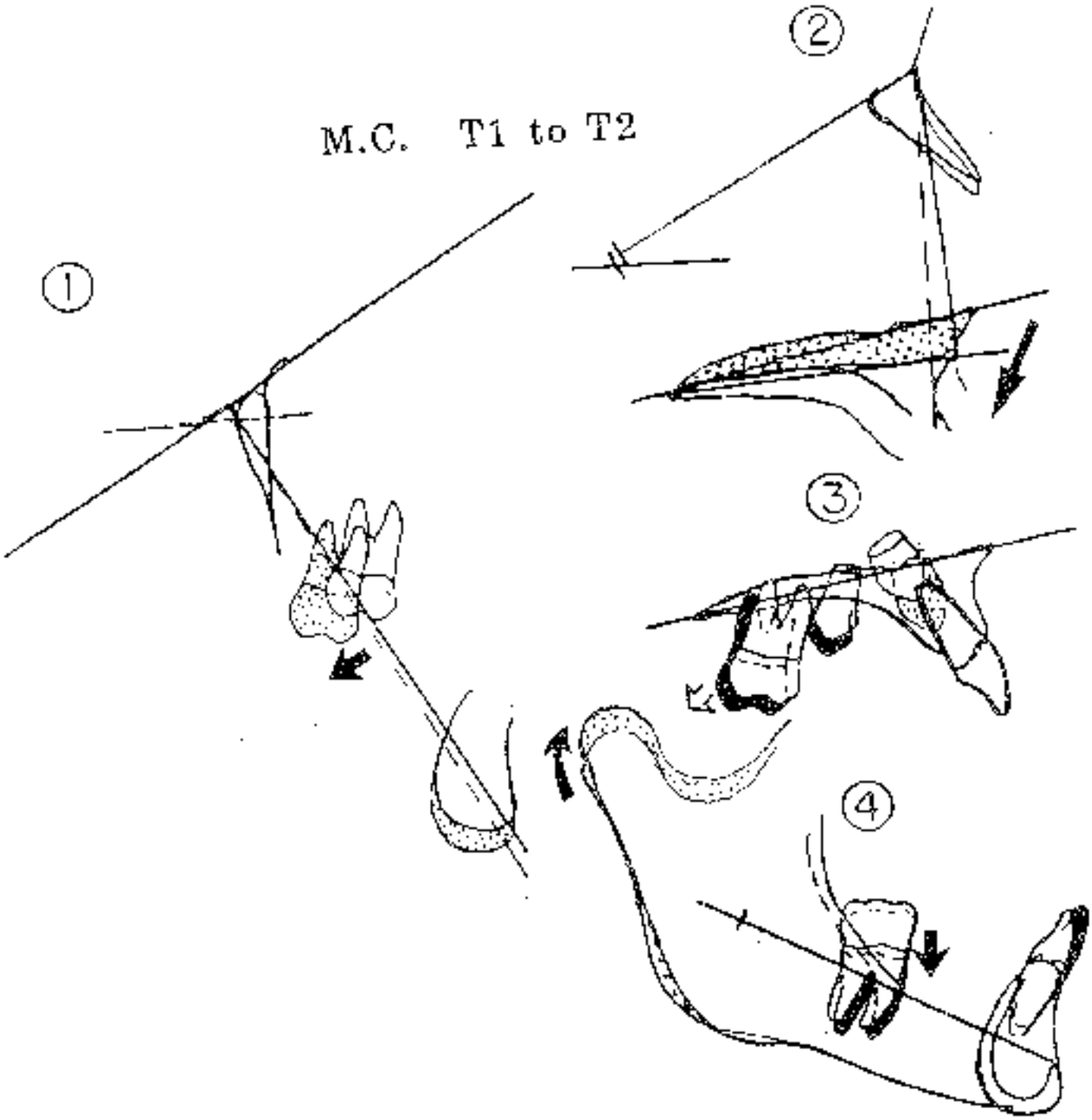


Fig. 17B. Transitional analysis showing major orthopedic maxillary alteration, lower molar intrusion, vertical condyle growth and only one degree mandible rotation.

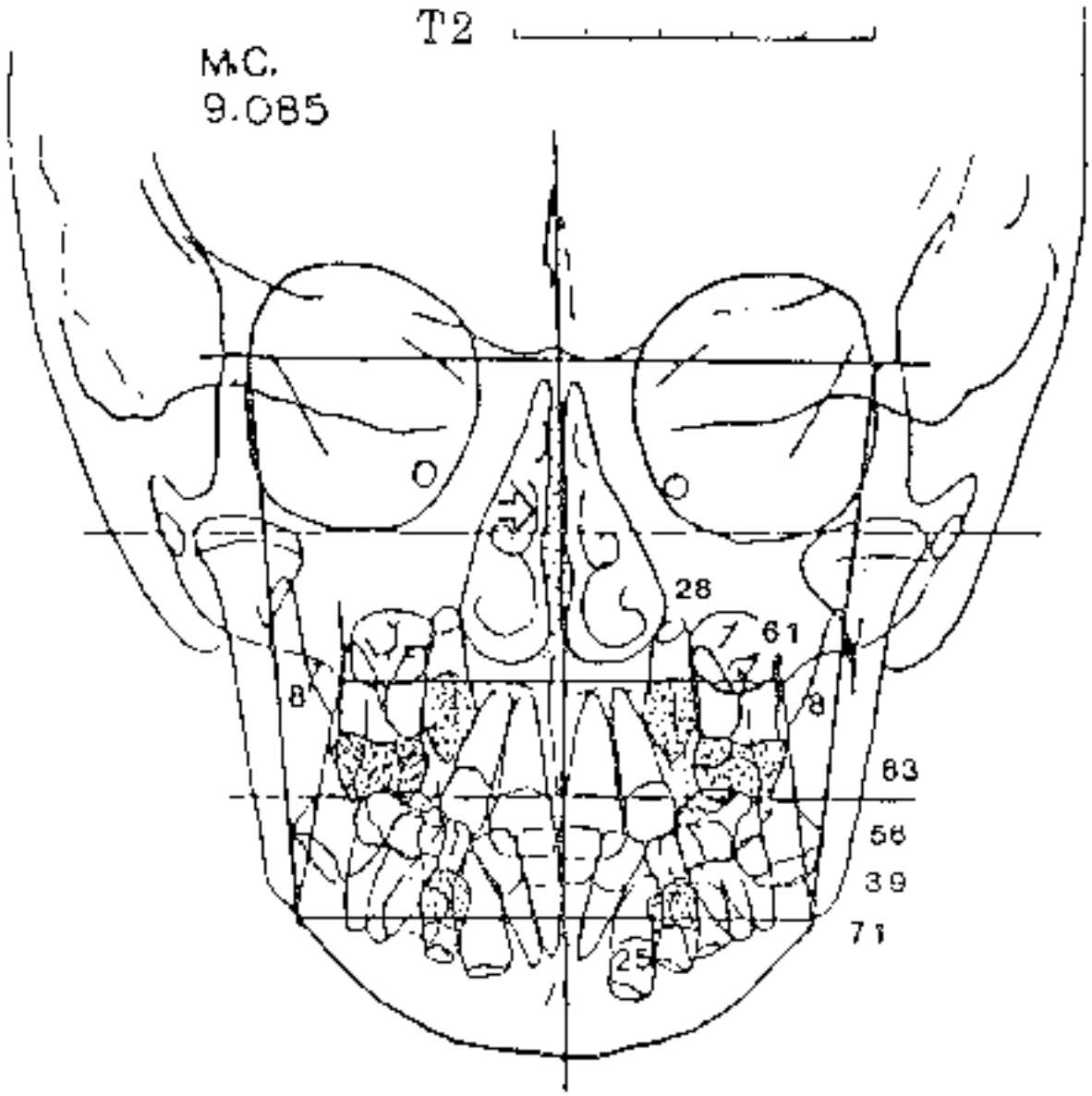


Fig. 17C. M.C. Frontal showing robus: transverse changes. Notice straight septum. nasal width and maxillary width together with symmetry.

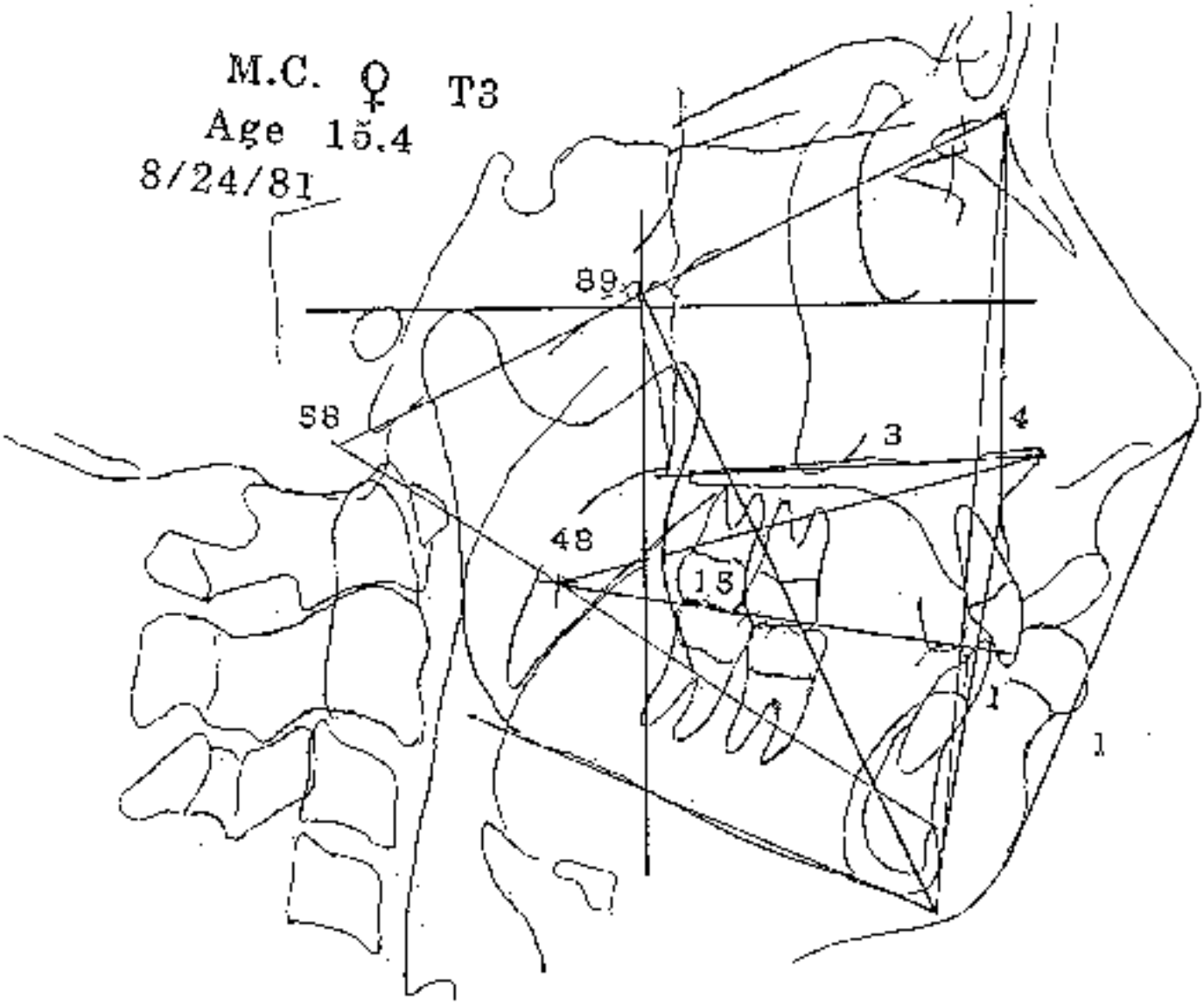


Fig. 17D. Post retention Age 15.4. Same patient as seen in Fig. 7, 8, 16 & 17 A,B,C.

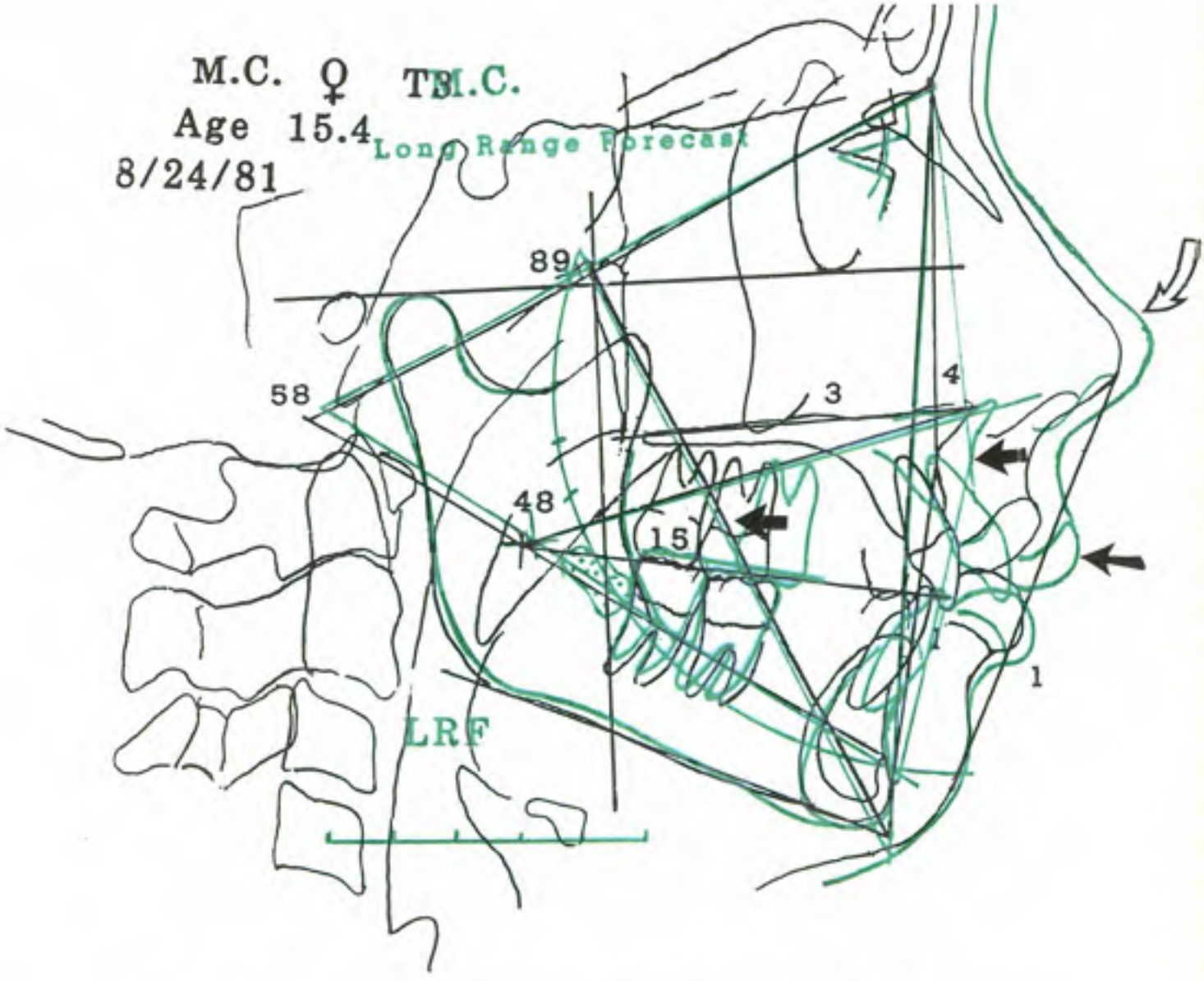


Fig. 17E. M.C. Comparison forecast without treatment. Forecast is in green. Notice the Remarkable mid-facial correction and upper molar difference of 6 mm, upper incisor of 10 mm and upper nose tip of 5 mm.

24. Controlling the Mandible

Earliest investigations on behavior of the condyle during treatment showed that almost one third of patients treated with Edgewise for Class II resulted in a condyle further distally and/or superiorly positioned in the fossa. In the mainstream of dentistry at that time this was considered favorable. This finding has now given rise to a different interpretation.

Bjork confirmed with implants in 1969 the Ricketts findings of 1952. An **upward and forward growth** of the condyle and ramus was consistent with **forward chin** development. A more upward and **backward growth** of the condyle was characteristic of more vertical **increases in facial height. (Fig. 18)**

At first, under the doctrines of the 1940s, the author accepted as taught that such different changes were strictly genetic. Forward or backward directional changes were an expression of type. Now it would appear that environmental factors must be superimposed over the genetic patterns, at least in time periods less than five years. These findings have a profound influence on clinical considerations. Unless damaged or diseased, the growth of the mandible and its position in the face in long term is remarkably predictable (see Fig. 17 D). When severely rotated by three degrees or more, the condyle and the chin will continue to drop or not recover.

The intent of forward posturing techniques has been to produce posterior condylar growth. If this is attained, then biologically, the chin drops more vertically (with the Ricketts-Bjork theory) rather than more forward in the face **unless it is accompanied by mandibular over-closure. (Fig. 19)**

On the other hand, records have suggested strongly that **increases in vertical growth of the condyle or even upward and forward growth on the arc** produced by posterior increases has been consistent with forward chin development.

Individual records have given the impression, and profound data was compiled by Baumrind in 1961 and Ricketts in 1960, that at least a temporary increase in posterior ramal height and chin position with cervical traction and often lower molar intrusion is a reality. **(Fig. 20)**

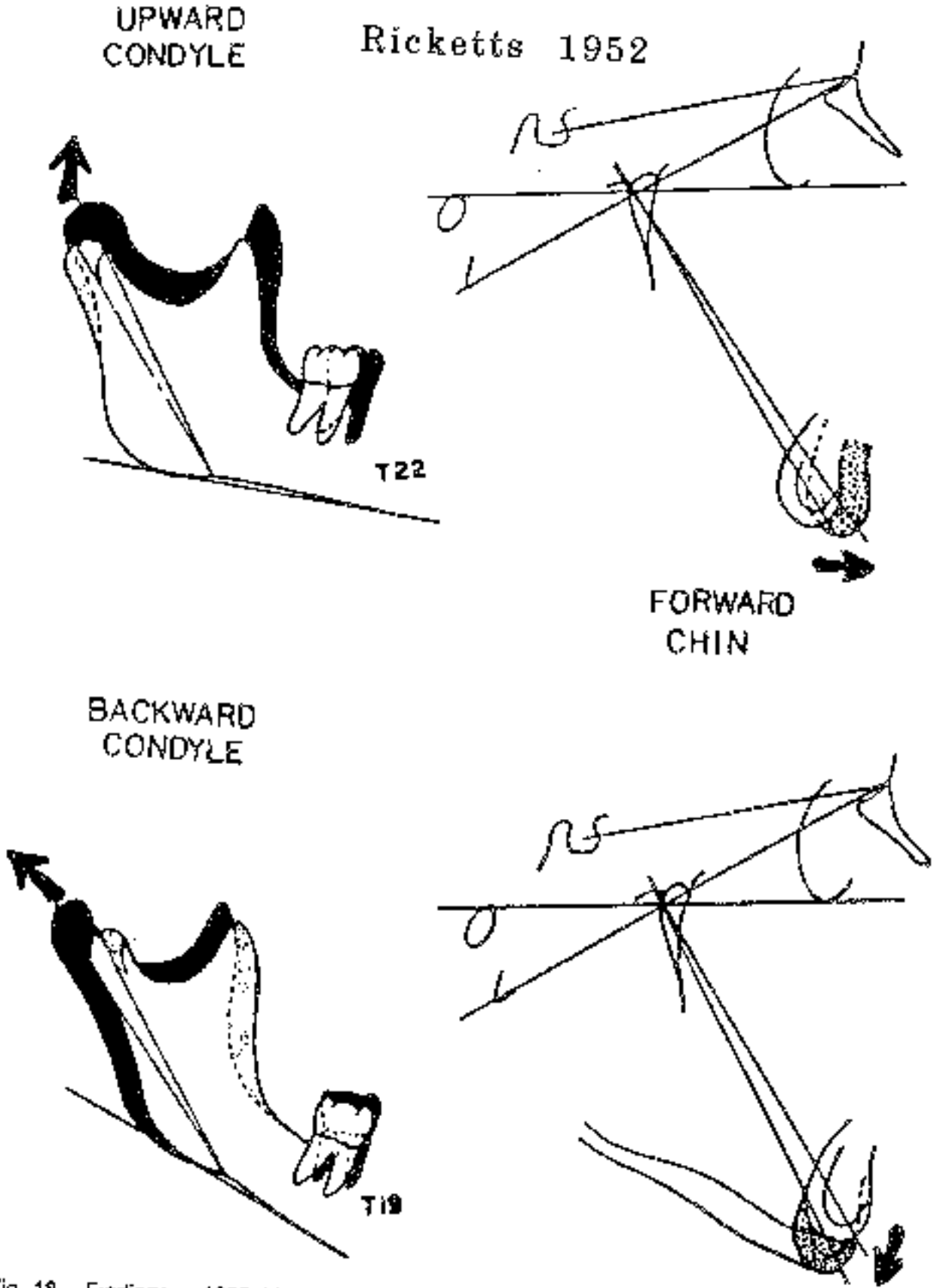


Fig. 18. Findings in 1952: Vertical ramal growth was associated with forward chin development. Backward bending was consistent opening rotation.

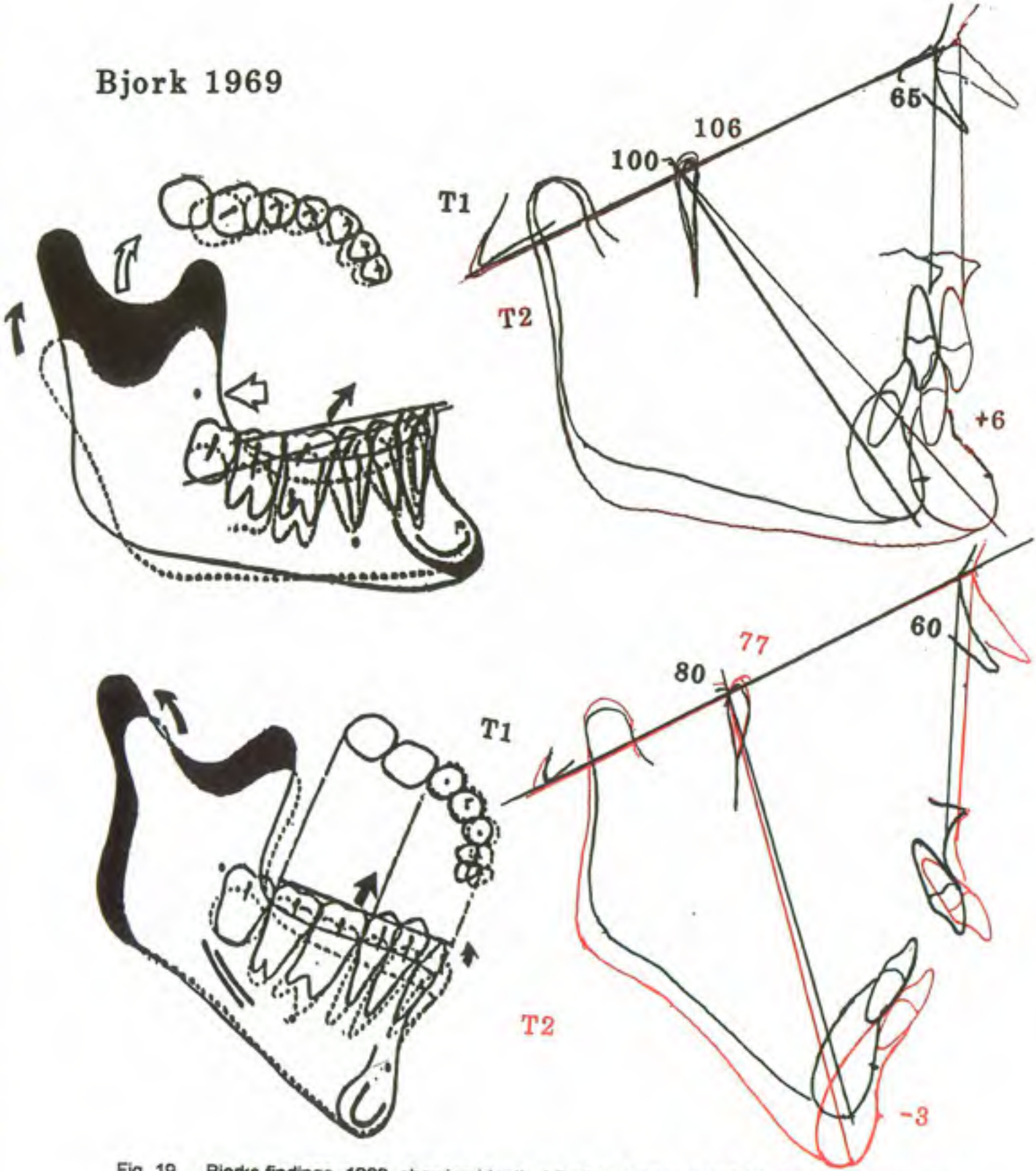


Fig. 19. Bjorks findings, 1969, showing identical findings as those of Ricketts (see Fig 18). The vertical growths appeared to be dependent on or concomitant with a respiratory obstruction patient with pathologic behavior.

DURING CERVICAL TRACTION

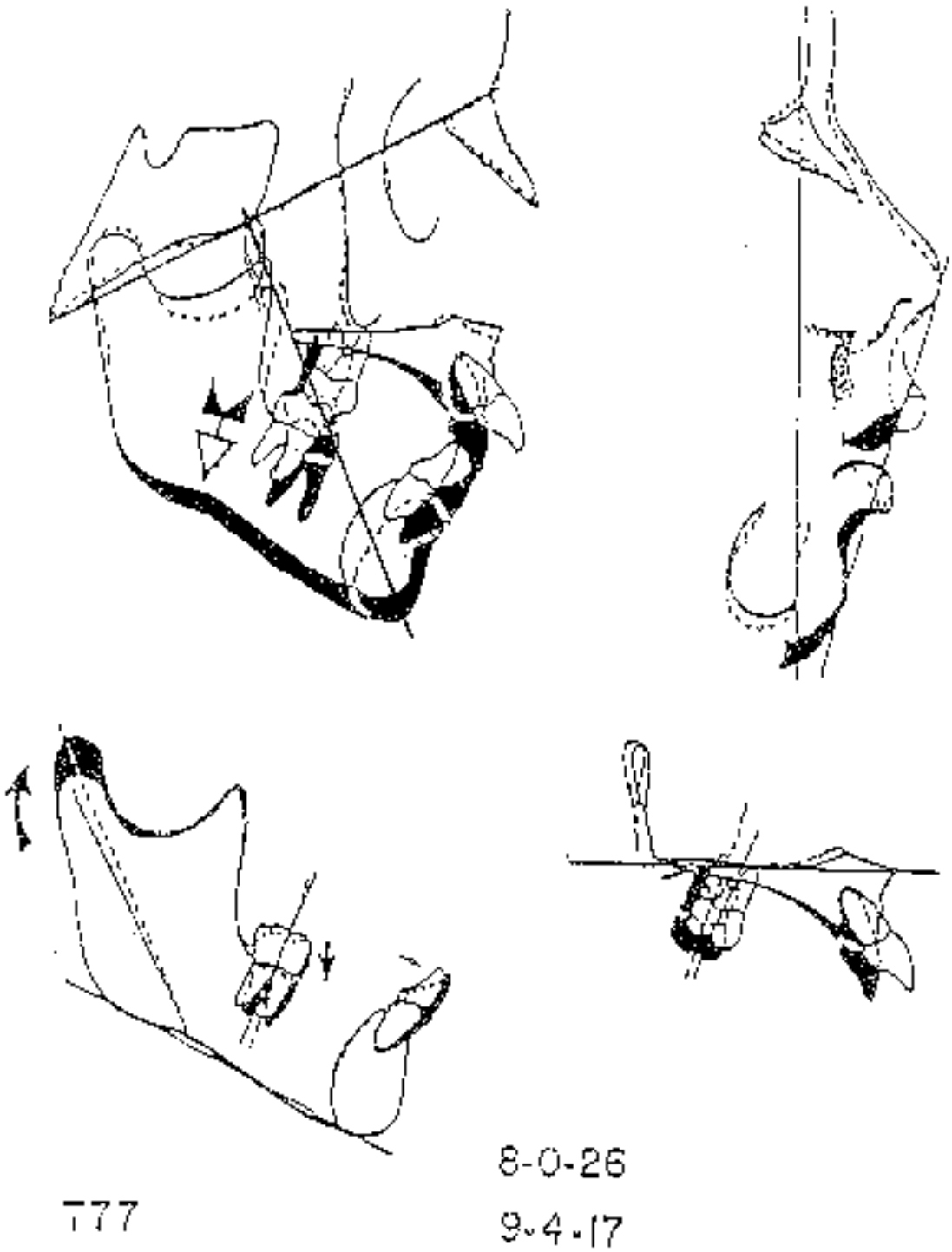


Fig. 20. Analysis of cervical traction in 1950. Notice the original severe open bite Class II. Note intrusion of lower molar and vertical condyle growth.

Our first data in 1951 accrued on treated patients with conventional straight wire orthodontics showed a **mean** rotation of four degrees (4.0°) on the Y axis. As now examined on the arcial matrix, the condyle would be assessed to be compressed against the eminence or at the depth of the fossa. If so, it is inhibited from normal growth expression. **The mandible with severe rotation, in effect, may become warped open and the chin retracted.** (See Fig. 18)

Recovery was seen in many patients. In others, said again, the vertical pattern "took off" and became worsened. In our ignorance, all this vertical behavior was considered to be due to genetics. Now we perceive it as iatrogenic.

Thus, the idea of "mandibular control" emerged. **It started with keeping the anterior teeth out of interference**. In effect, it meant treating **the overbite completely before completing the over-jet correction.** This, in turn, gave rise to the idea of intrusion of anterior teeth for deep bite. It went on to consider occlusal plane control by cortical anchorage and **treating the lower arch to the original level of the first premolars**. These premolars, replacing the deciduous first molars, represent true physiologic face height. The theory developed that up to two degrees of Facial Axis rotation is within safe limits. Opening further than that is thought to invite condyle compression of a secondary nature.

Thus, the two aspects of rotation emerged. The first was the prevention of physiologic rotation for bite opening. The second was for the growth behavior of the mandible.

The findings from use of the X point and Pm point became a discreet matrix to measure the behavior of growth during treatment. Before its use, as a central or core matrix, the external features were often confusing and inconclusive. With the new matrix and the use of the critical Facial Axis, the details are revealed for open or closing phenomena.

Histology

For 200 years it has been believed that the condyle grew straight upward and backward thereby thrusting the chin downward and forward in the face. Cephalometric tracings superimposed in the conventional manner, with the lower border of the mandible registered at the chin, seemed to show it. (See Figs. 12 & 13) It followed, therefore, that causing the condyle to grow more backward would hasten the chin to develop more forward.

However, implant studies of Bjork and others, and experimental work led to the discovery of curve of growth passing not through the condlyle but through the triangular ridge at the medial aspect of the coronoid process. (See Fig. 12) This curve, applied to the growing mandible suggested the condyle to typically grow **upward and slightly forward**.

It was as if workers were so convinced of the direction that they did not closely examine the histological evidence.

The cross sections **(Fig. 21)** of three human subjects through the condyle are shown to yield the same characteristic evidence: (1) The cartilage is disturbed and thickest on the upper anterior location; (2) the orientation of the developing trabeculae is inclined forward and (3) islands of **resorption are observed on the posterior side of the condyle.**

Other examples with stains in the living human tell the same story. Inhibition of mesenchymal and cells and effects on the prechondrogenic area by compression would stifle condylar growth vertically. Only the posterior cells could proliferate forming a flattening picture. This is precisely the condition that is observed. **The result is a developing retrognathic pattern**. It can occur from breathing problems in which the mandible is held chronically forward for airway provision It can also be iatrogenic.

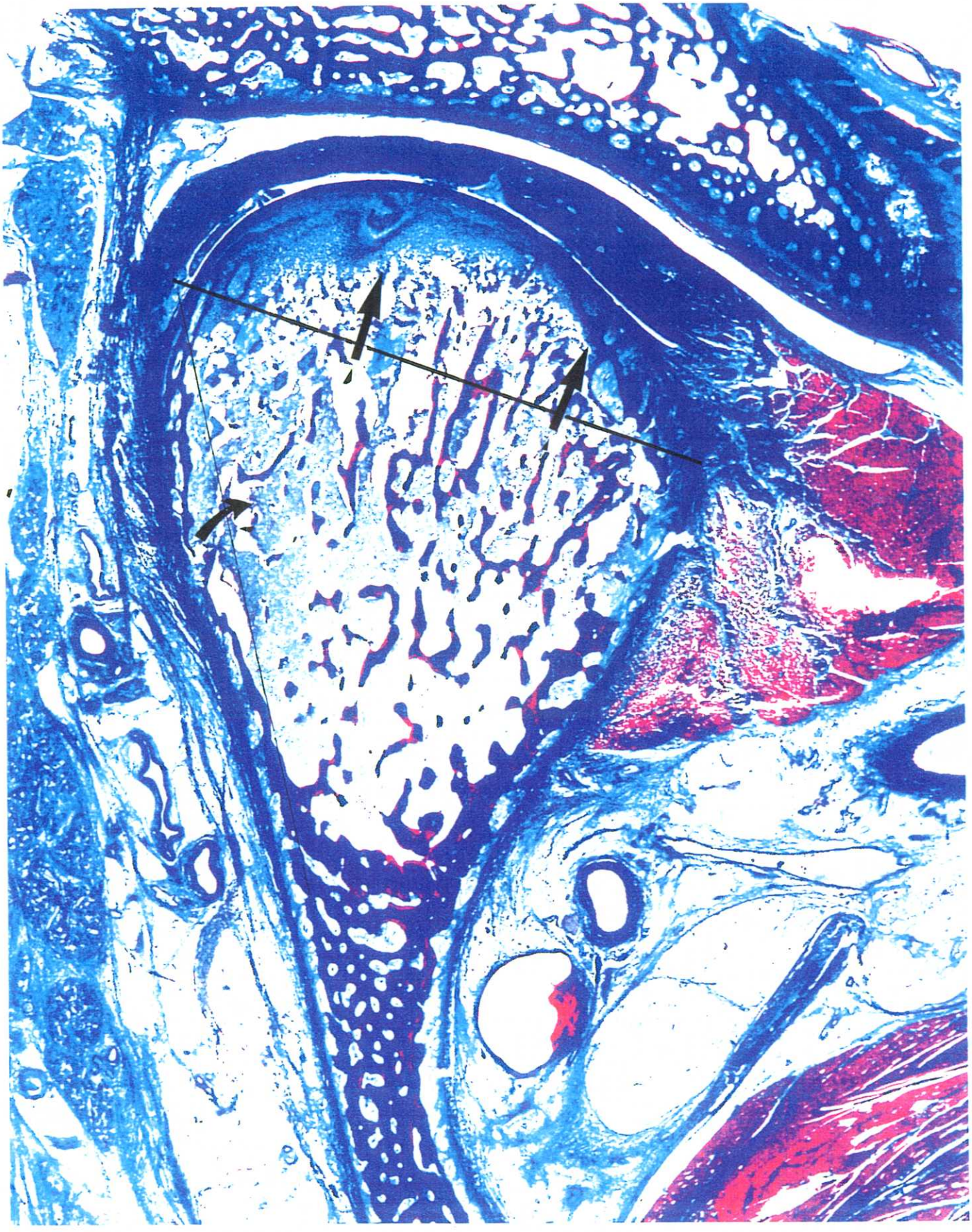


Fig. 21A. Section through a condyle of 15-month child. Notice at the arrows the direction of the cartilage and resorptive bays at the posterior site.

Fig. 21B Child at birth. Note the cartilage direction, trabecular direction and posterior resorption.

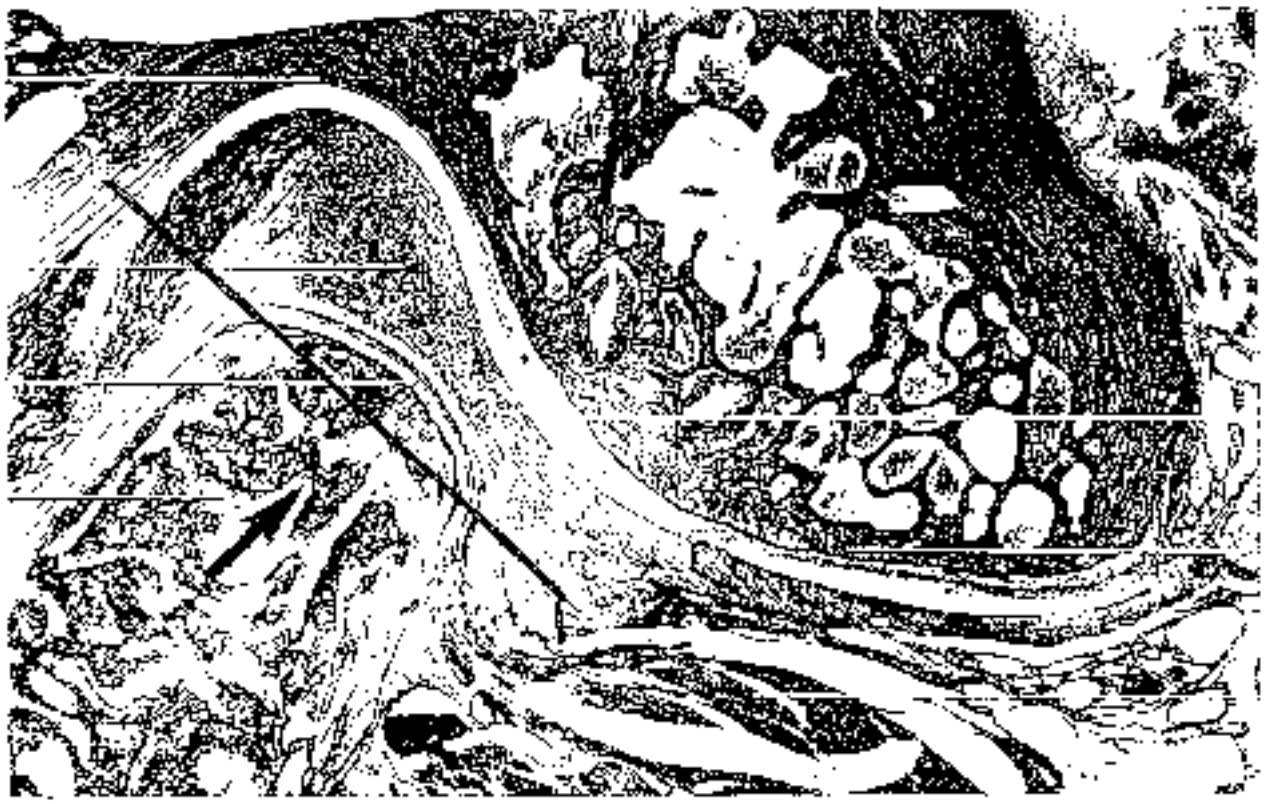


Fig. 21C Section of 26-year-old male with cartilage distribution upward and forward

In conclusion, three treatment experiences have been found to inhibit vertical condyle growth. These are:

1. Excessive forward condyle positions with a transference of function near the eminence summit. **(Fig. 22A)**
2. Excessive mandibular rotation for treatment of deep bite. Class II unfavorable. Class III favorable. **(Fig. 22B)**
3. Intrusion of upper molars with high pull face bow for open bite. **(Fig. 22C)**

In Class III, condyle inhibition is favorable. We could theorize that forward posturing and over-closure could set off prognathic growth. Therefore, all Class III conditions should be corrected no later than age 5 years. **(Fig. 22D)**

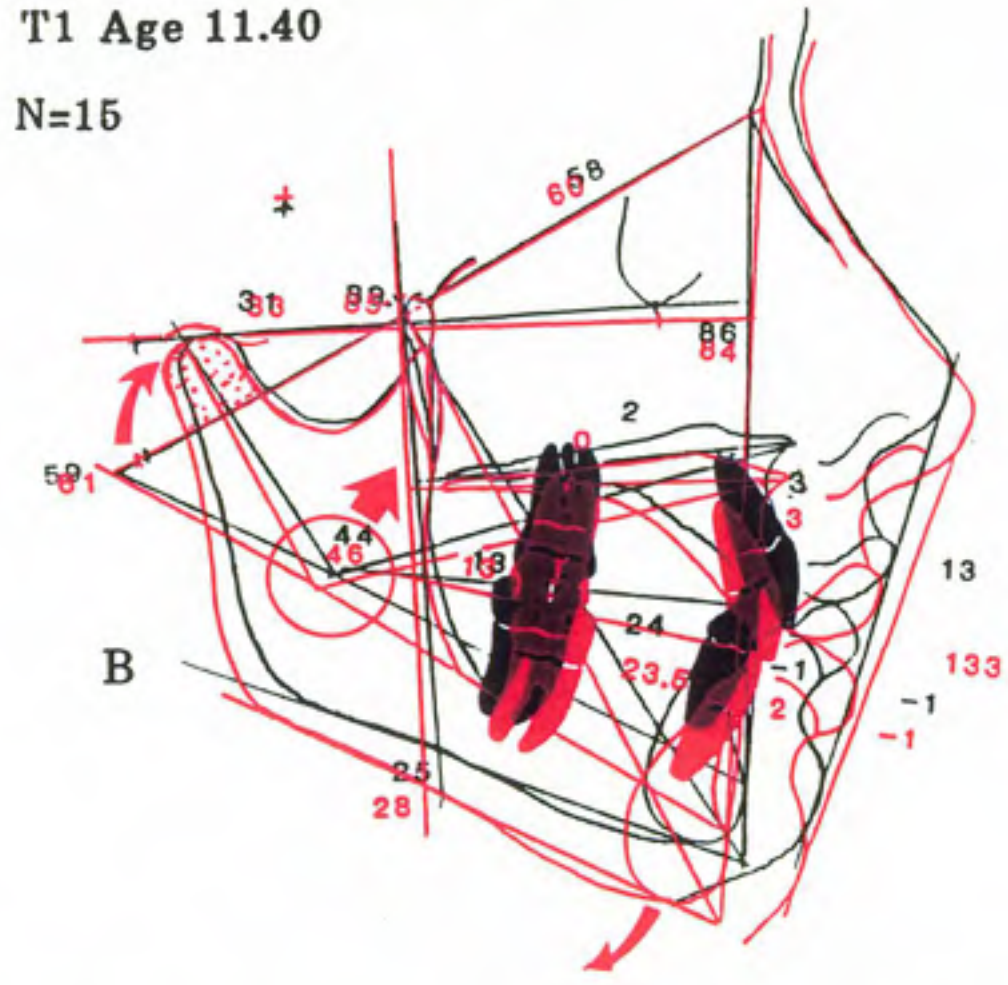


Fig. 22 A Rotation of the mandible beyond two degrees has been noted to compress condyle by muscle fulcruming. Phenomena noted in mean behavior in N=15 sample of children treated with bite leveling and intra-oral elastic traction.

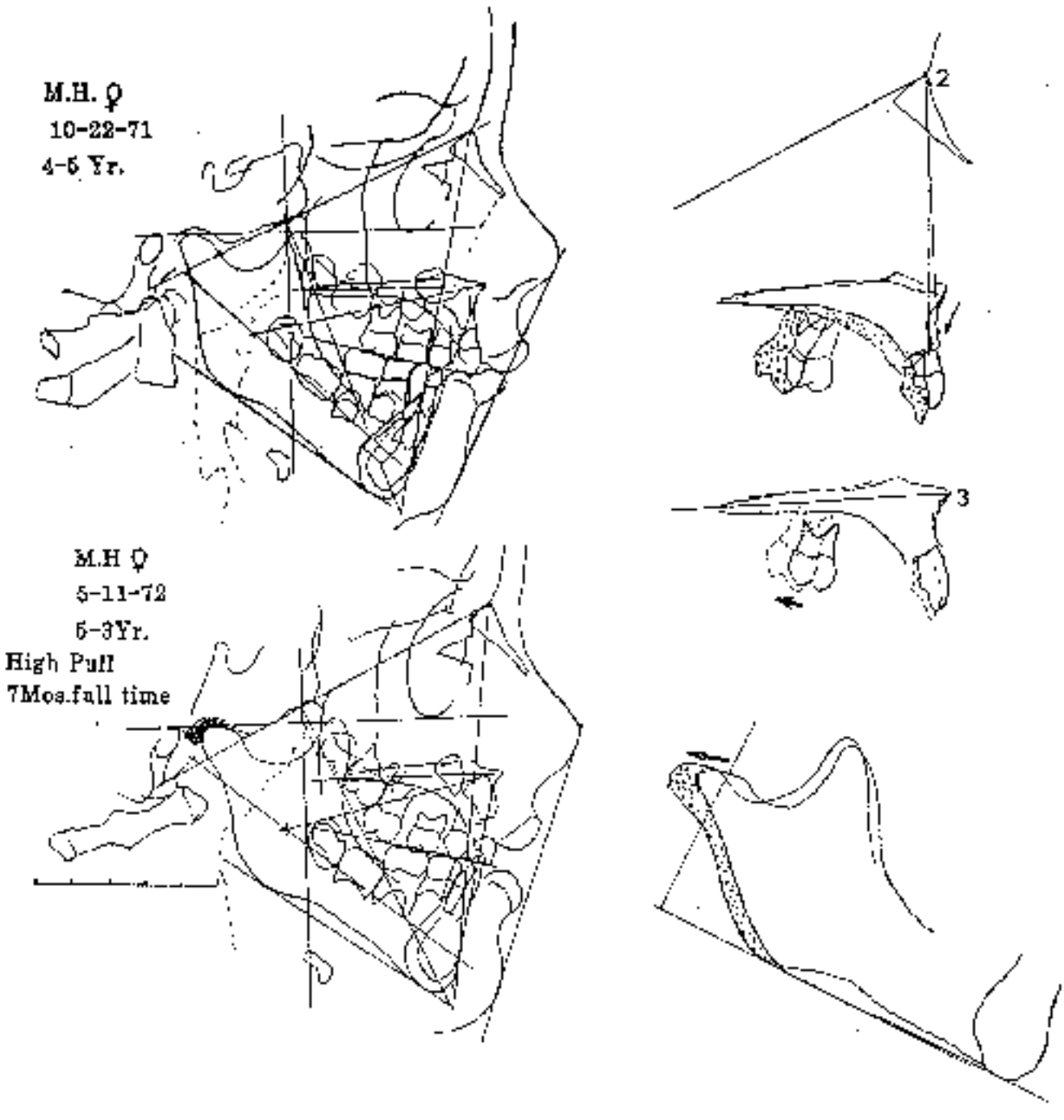


Fig. 22 B A four year old child, open bite treated with "high pull". Facial Axis closed but patient postured the mandible forward. Note flattened condyle and posterior growth showing condyle behavior alteration.

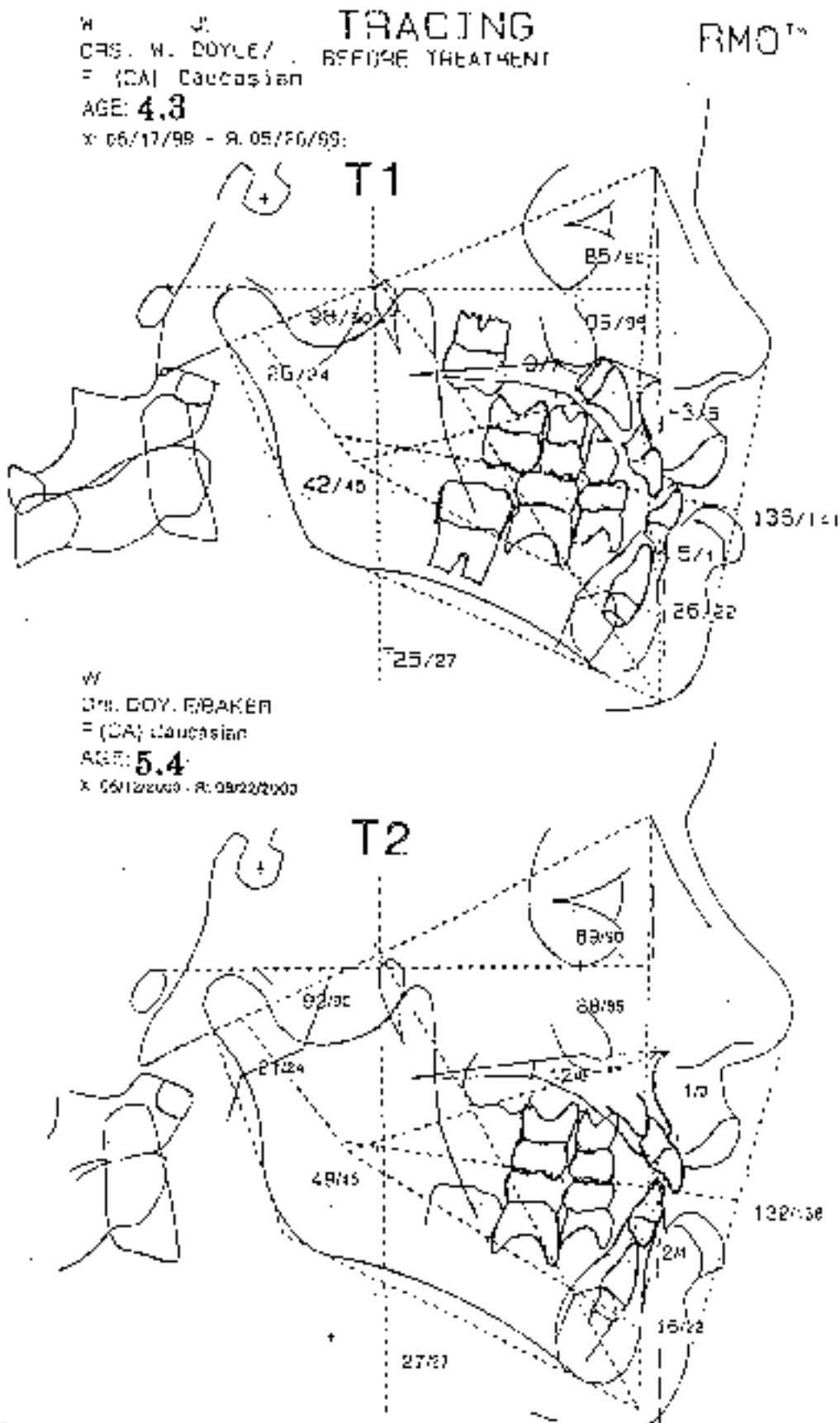


Fig. 22 C (1.) A four year old treated with facemask for Class III Facial Axis was 98° and opened to 93°. Courtesy of Dr. W. Doyle

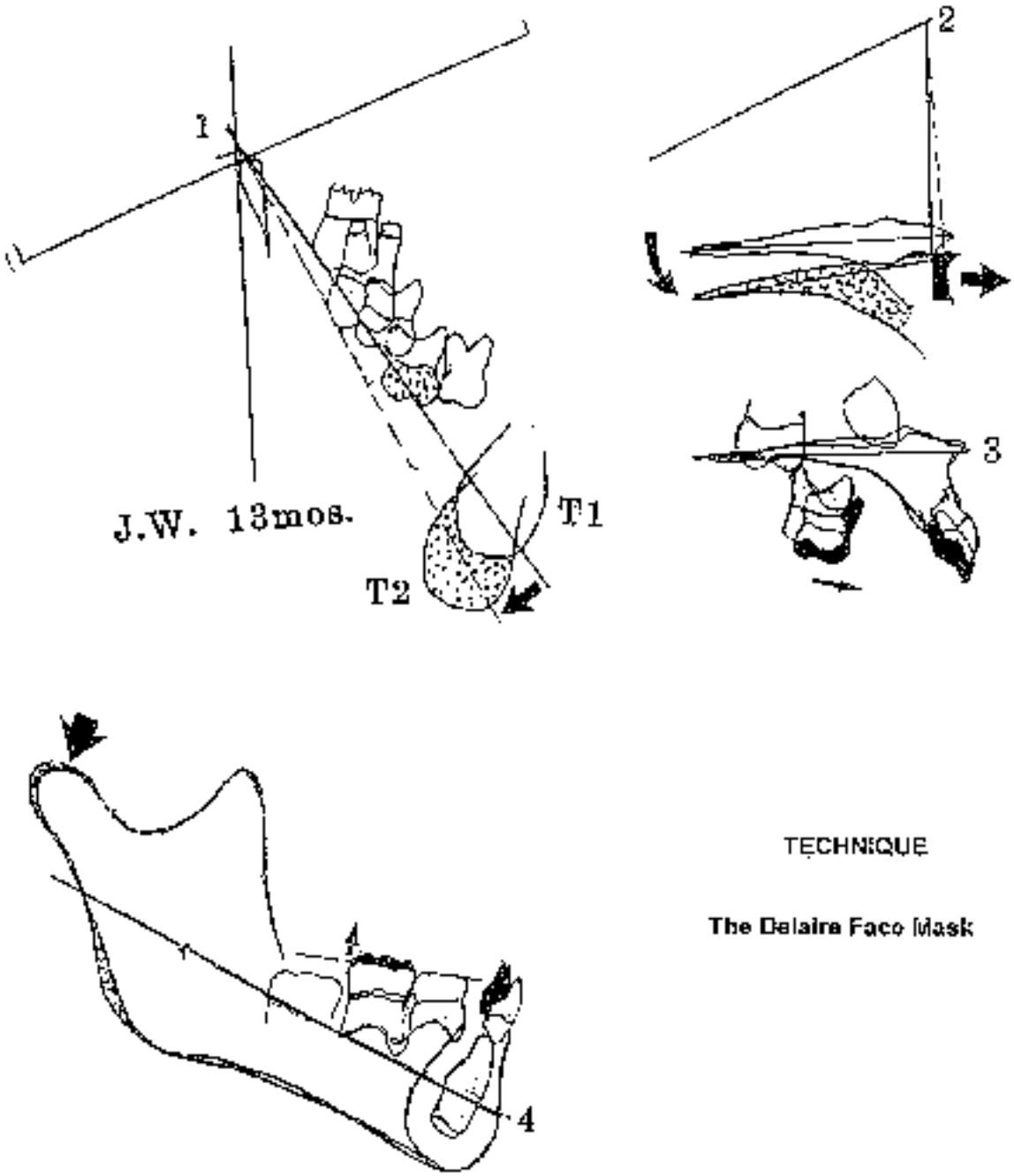


Fig. 22D.

(2.) Transitional analysis of Class III. Note rotation of chin. Note in Position 2 the behavior of the hard plate and maxilla. Notice essentially no vertical growth of compressed condyle in 13 months.

25. Early Treatment Advantages

Five general disadvantages to early treatment are usually expressed by clinicians. The long-term management, economics, and the fear of relapse dominate the concern. However, there is an eight-fold advantage listed for early treatment making forty specific factors.

Early treatment is aimed first at producing skeletal morphologic harmony. This transformation is automatically followed by a change in function. In turn, the natural forces of occlusion are recruited and natural growth is utilized. Orthodontists who are simply tooth oriented find this difficult to conceive. Further, the anchorage factors are poorly comprehended. All these issues require a special course unto itself. A four-volume manual was prepared for self-education in early treatment.

26. Temporal Bone Monitoring

The temporal bone on a clinical basis has been taken as a "given". By superposing tracing from birth onward, the internal and external auditory canals have revealed a strong stability possibly due to the petrous bone and its contents. Experimental laboratory work has shown, however, that alteration of nerve and muscular elements may affect the development of the whole temporal bone as a unit.

In addition, the temporal bone sits on the occipital and sphenoid bones and it "flaps over" the parietal bone. The petrous portion of the temporal is wedged between the basi-occipital and horizontal shelf of the great wing of the sphenoid. The temporal bone also supports the jugular fossa. Consequently, the temporal bone would appear to be a "basic" in cranial morphology. Heavy muscles are attached to the mastoid process.

In 1990, computer generated data revealed the glenoid fossa to move posteriorly 0.5mm per year or 5.0mm. in 10 years. **(Fig. 23 A)**

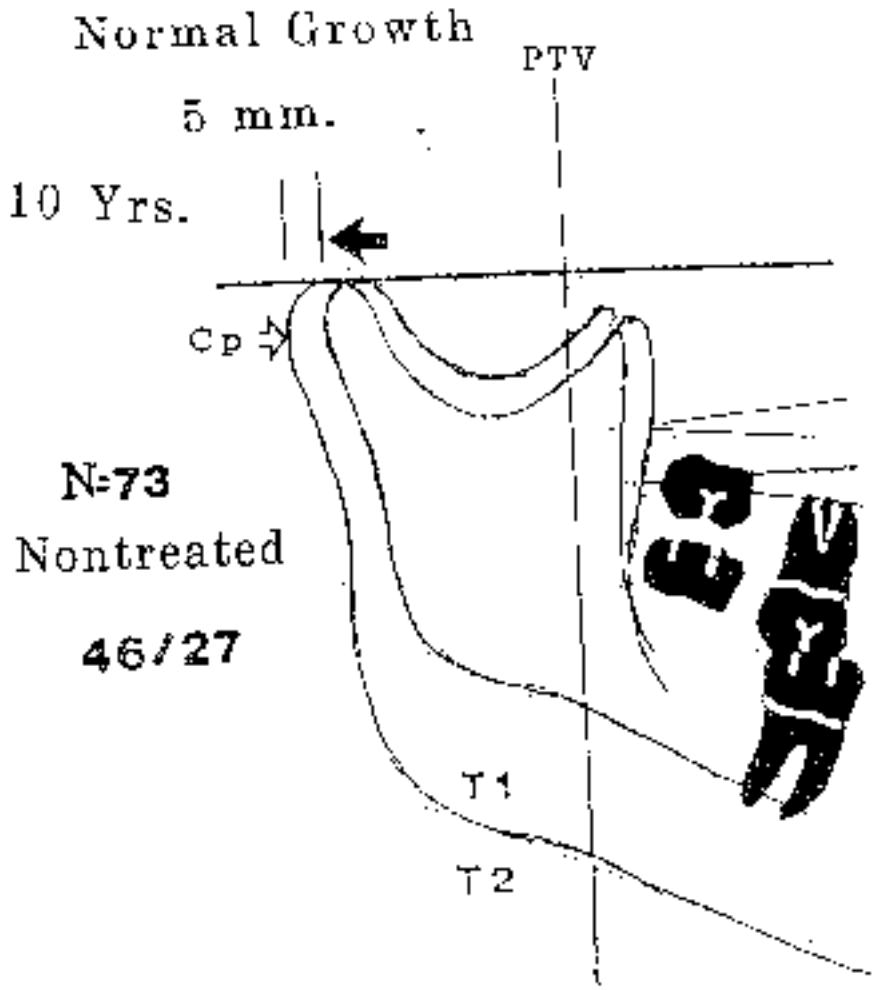


Fig. 23A. Information from computer data, 1969, confirmed in 1990, revealed a mean of 5.0 mm./1 year (or 0.5 @ year) posterior movement of the condylic at Posterior Condylion (Cp) from the Pterygoid Vertical (PTV).

Developing deep bites showed the greatest posterior temporal bone displacement during development of all types studied out of 133 patients. **(Fig. 23 B)**

The temporal bone position can be registered as Porion, which has long been employed in anthropology and craniometry. To suggest that it can be affected clinically is a very reserved statement. Individual patients and composites of groups of patients, however, have intimated that posterior development as measured from the pterygoid vertical plane (PTV) has been less in patients or groups treated with cervical traction. **(Fig. 23 C)** A Class III age 8 treated with Face Mask showed the joint backward at a rate of 0.8 mm compared to 0.1 for the cervical traction group. In long range, rebounding may occur.

This component of correction of Class II and Class III had not been conceived before. It must await larger studies. Moreover, two other significant groups yielded similar results

Of further interest is the rotation of the temporal bone squama position relative to the petrous portion and the **development of the articular eminence** in the joint. Clinicians and researchers focus on the condyle and very little on the growth of the eminence. These are areas needing further detailed study and the method for analysis needs to be highly critical. Point Sella only adds mystique to the situation.

It is further recognized that temporal bone dysplasia is a prominent component of Class III malocclusion.

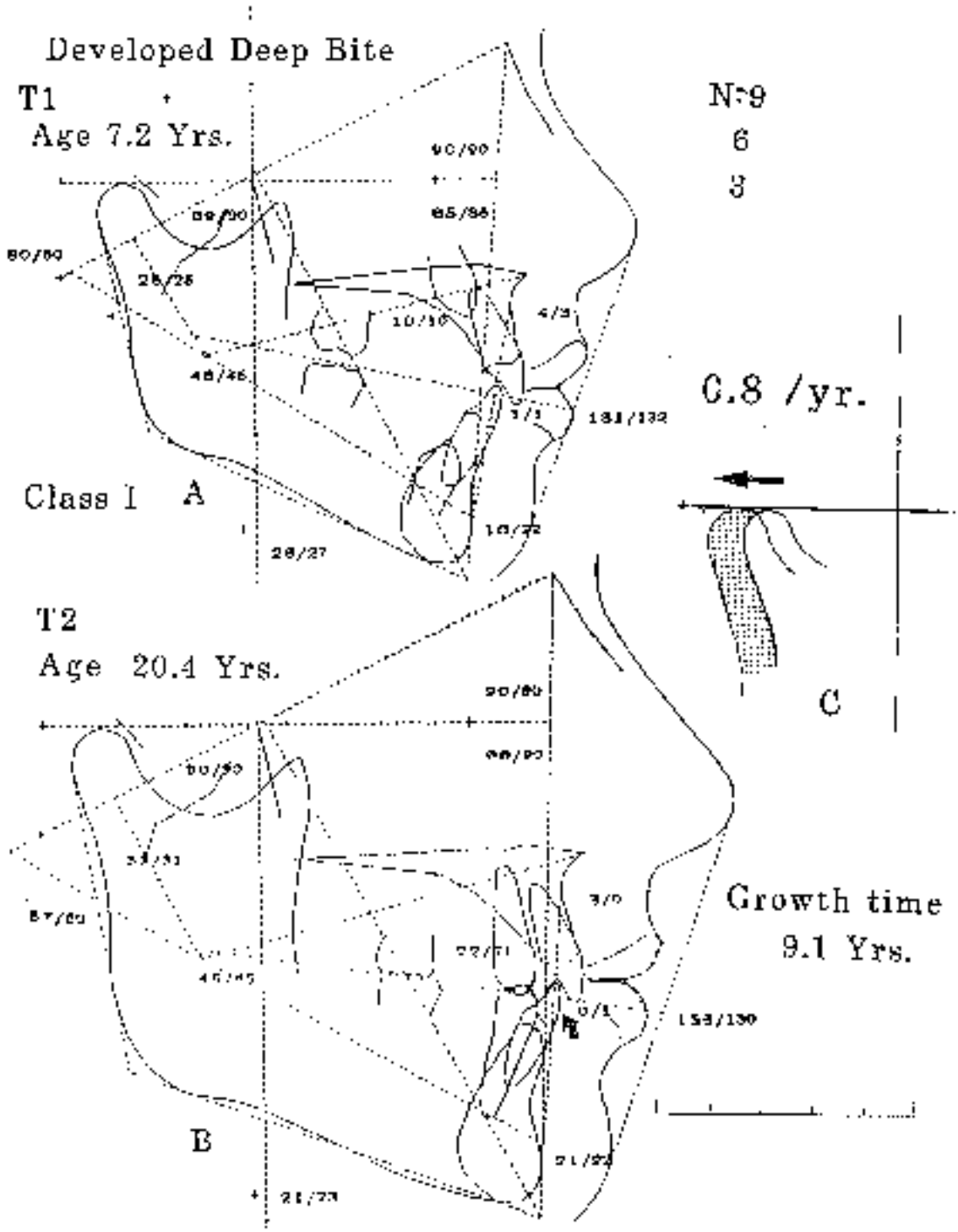


Fig. 23B. A sample of nine non-treated children who developed deeper bites. Showed as a mean of 0.8 mm distal movement of the condyle with development.

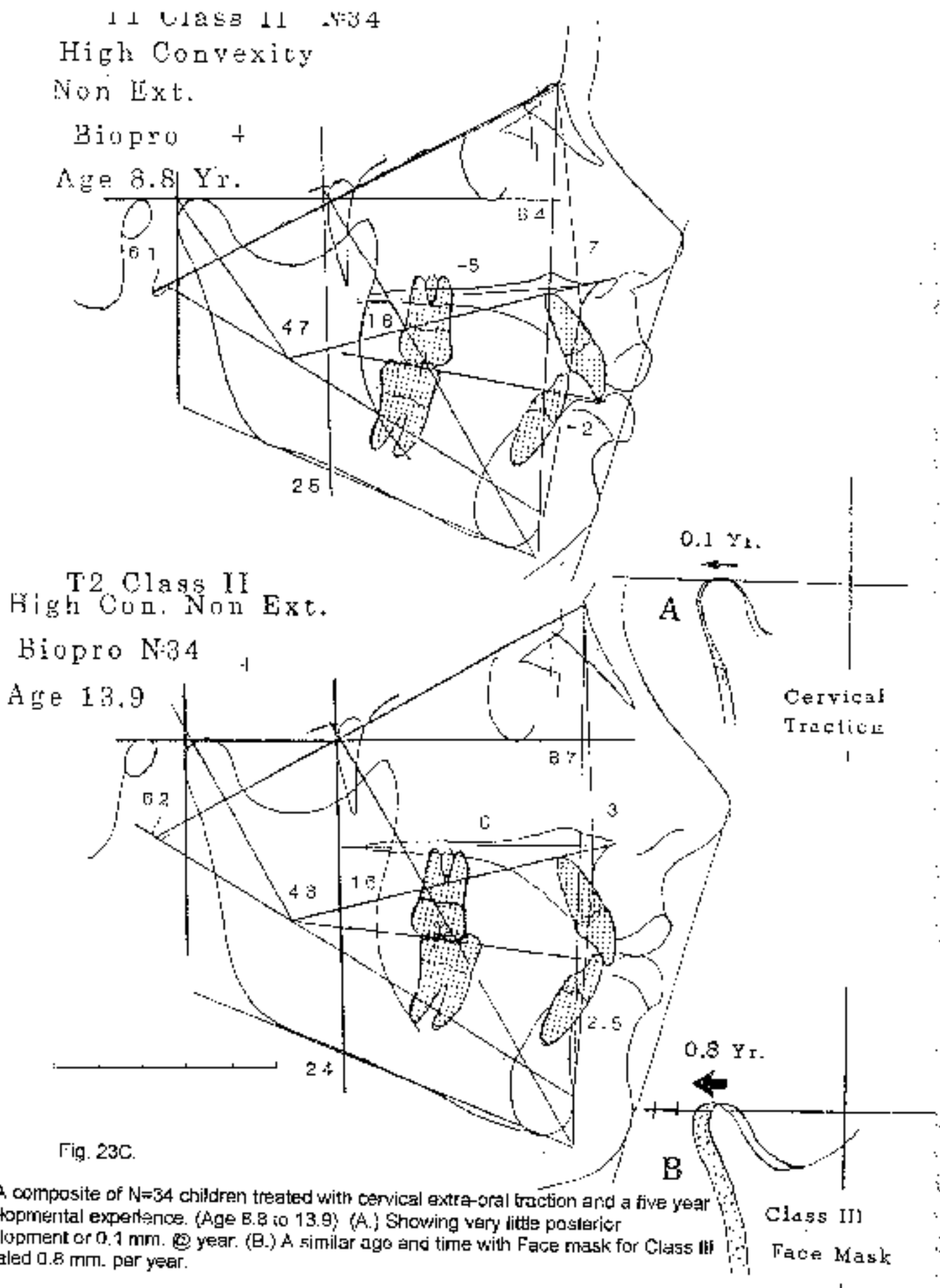


Fig. 23C.

A composite of N=34 children treated with cervical extra-oral traction and a five year developmental experience. (Age 8.8 to 13.9) (A.) Showing very little posterior development or 0.1 mm. @ year. (B.) A similar age and time with Face mask for Class III revealed 0.8 mm. per year.

27. Temporomandibular Joint Pathosis Classification

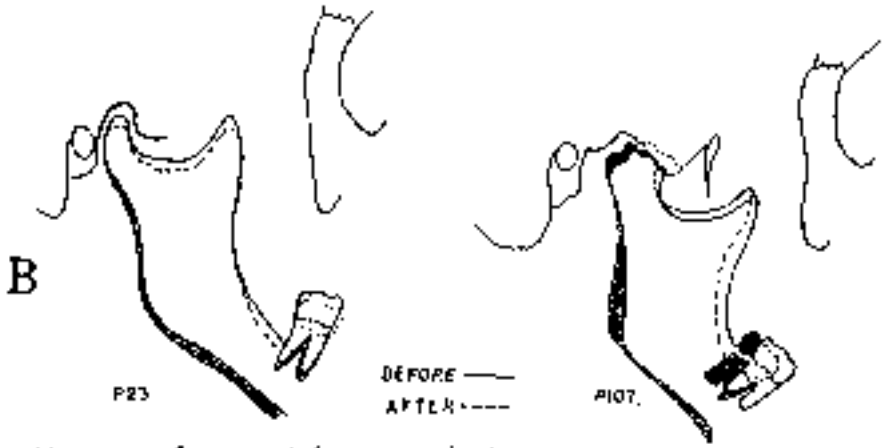
We classified the types of conditions observed in different conditions of the occlusion in 1950. Four basic types were found. They were (1) distal displacement (distraction), (2) absence of vertical posterior support (compression), (3) a contra-lateral interference phenomenon and (4) anterior range of function. Nothing has been found in half a century to alter that original presentation. MRI has only confirmed the original contentions. Treatment has undergone an evolution, however. **(Fig. 24)** A four part manual has been formulated by the author for information and treatment of the TMJ.

28. Degenerative Joint Disease

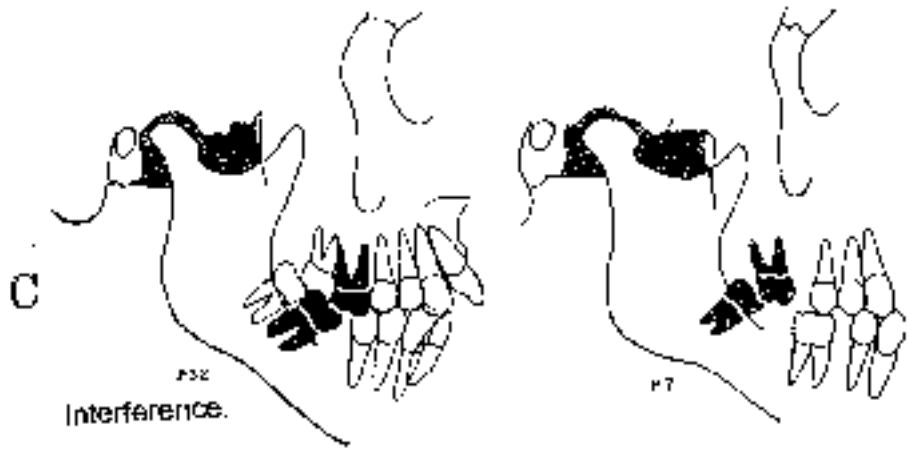
It is a mystery why the whole degenerative process in the condyle, and the condyloid process together with alterations in the fossa and eminence, are so under-appreciated on a clinical basis. Perhaps orthodontists are so preoccupied with the profile that they simply do not examine posterior morphology or maybe feel it is insignificant. Secondly, the routine use of tomography is not popular. However, extremely major regressive changes can occur in the joint of one or both sides and go unrecognized. Ideopathic hypertrophy also can go unnoticed for a long time. **(Fig. 25)**

A significant factor also is that such conditions can be iatrogenic despite some claims to the contrary. Some changes have been called idiopathic aseptic necrosis. It is as if the neurotrophic supply to the joint has been impaired. The findings are so dramatic that, anytime a severely vertical growth pattern is observed the patient probably has undergone a distressed condyle. **(Fig. 26 A & B)**

Distal displacement.



Absence of support (compression).



Interference.

Forward range of function (damage of eminence may be first).

Fig. 24. The Classification, 1950, of four types of functional occlusions giving rise to disturbances of the temporo-mandibular joint. Nothing has changed since then except the controversy.

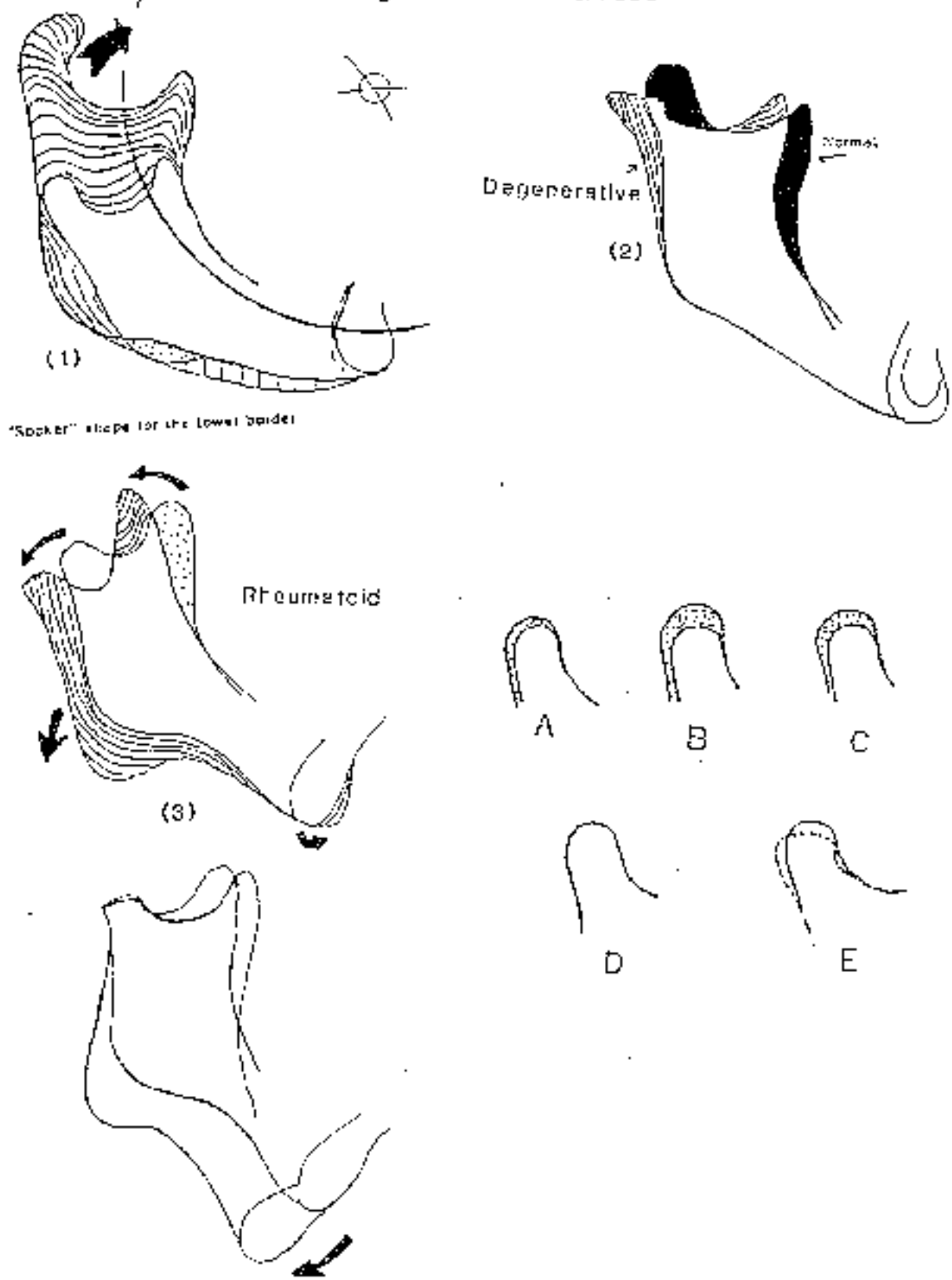


Fig 25. Types of growth problems in joints: (1) Condylar hypertrophy (2) Osteoarthritis (degenerative), (3) Rheumatoid. Localized differences in condyle growth (A-E)

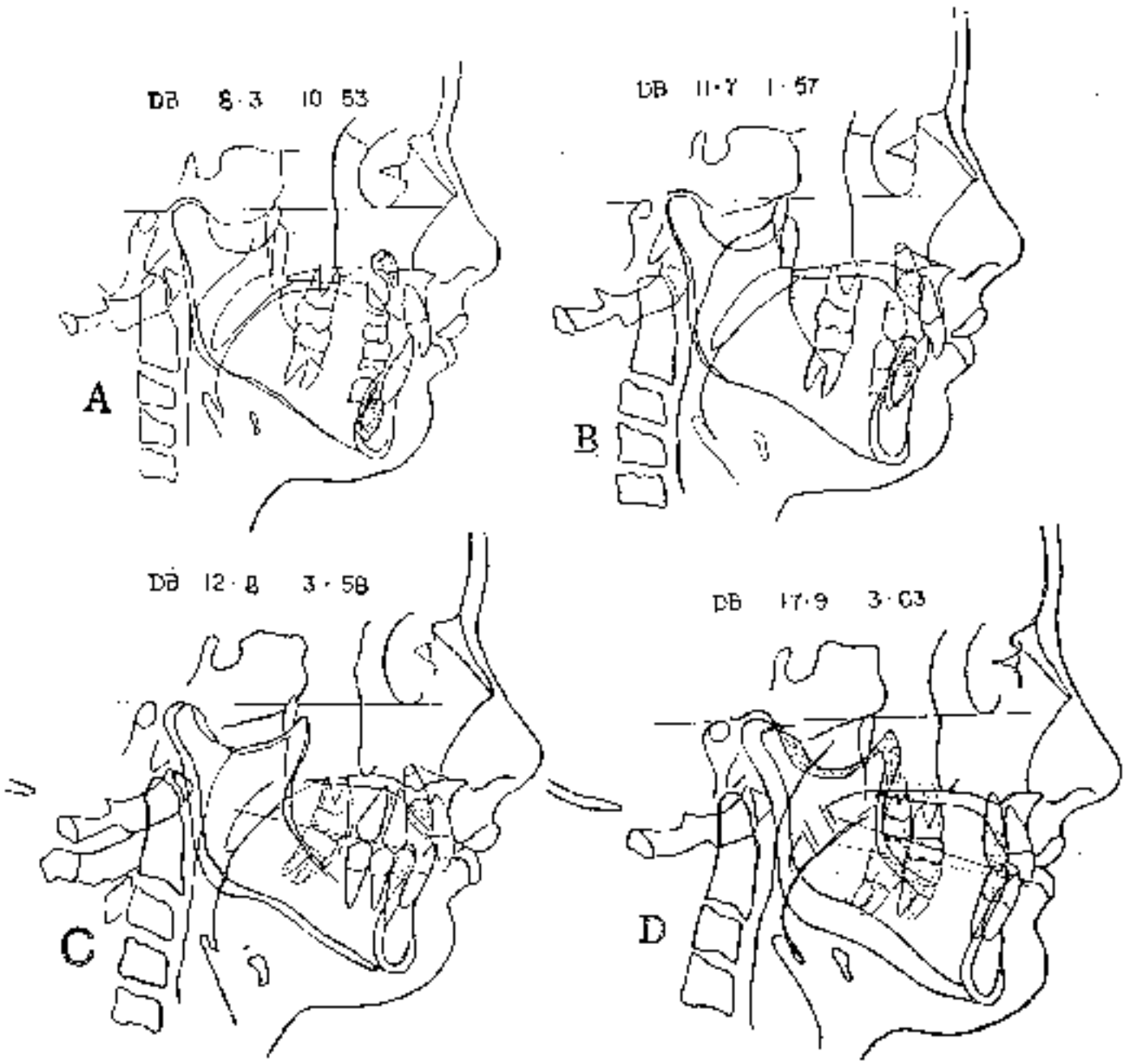


Fig. 26A. Degenerative joint disease following first molar extractions at age 11.7 (B). Note that in one year degenerative changes occurred in the right joint (C). By age 17.9 (D) the changes were advanced. D B. seen in Fig. 25.

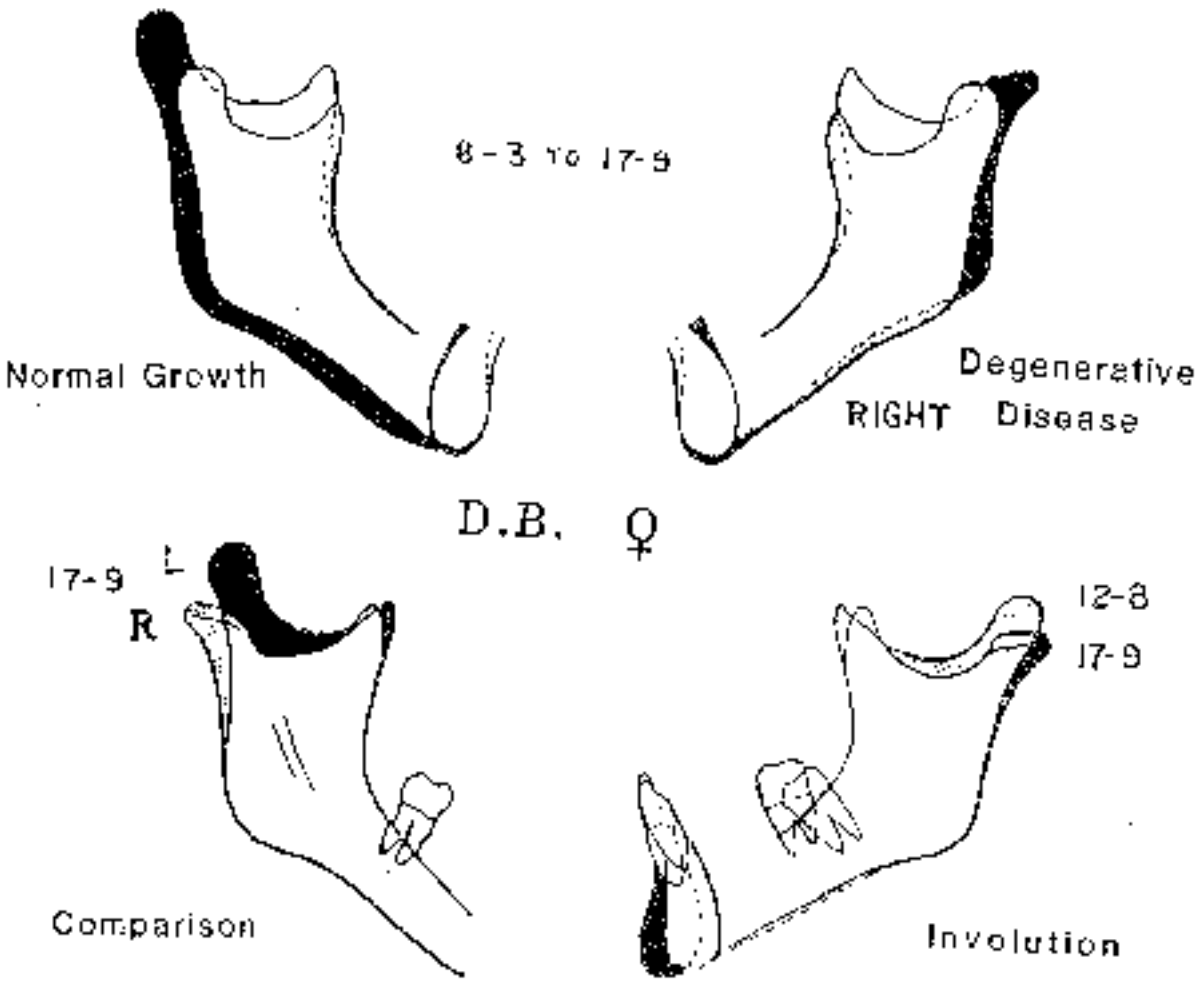


Fig. 26B. Joint and mandibular serial tracings showing normal left side and diseased right side in patient D.B. seen in Fig. 26A.

PART III

MECHANICAL DEVELOPMENTS AND TECHNOLOGY

In his seventh edition, Dr. E. H. Angle stated:

> Of necessity, the history of appliances is closely connected with the history of orthodontia and largely measures its progress. One surprising feature of the history is the frequency of rediscovery of identical principles, their materialization differing only in minutiae of manufacture. . . . .The first appliance that was destined to mark a distinct step in the written history of orthodontia was that given to us by Fauchard, of France, in 1726, and which we will call the expansion arch, for its chief function is to expand the dental arch.

Mechanically, three general movements have occurred in the specialty. All are practiced currently. Functionalism, the first, was characterized by mandibular manipulation, which became the resolve. Traditionalism, the second wave, converged on tooth manipulation alone. It limited the prospects of skeletal change. Progressivism, the most recent, took the best of both previous theories and organized treatment into stages toward a goal gauged to maturity. It emphasized a doctrine of possibility. Thus a discussion of mind stretching must have a starting length.

Ideas that set the Stage for New Movements

Some ideas that set the stage for new movements of these are:

1. Three planes of mechanical control were proven desirable, which led to lighter square wires. (1950)
2. Progressive engagement of teeth was consistent with techniques for early treatment before all the permanent teeth were available. (1952)
3. Sectional mechanics and cortical anchorage changed the possibilities and hence the objectives of treatment. (1954)
4. Lighter wires led to the use of more continuous and lighter pressures. This in turn led to safe expansion which led to smaller bracket slots 0.46 mm (.018") (1958) and further to 0.43 mm (.017"). (2002)
5. The ability to (1) accomplish maxillary orthopedics, (2) move molars distally and (3) to intrude teeth changed the clinical objectives further. (1960)
6. Prefabrication (preformed bands) permitted the development of prescription brackets. (1961)
7. Fixed mandibular posturing methods (Herbst) demonstrated astounding forward placements of the lower incisors. In contrast to Tweed followers who seldom planned to move incisors forward, these techniques even further changed possibility, attitudes and objectives. (1973)
8. Bonding brought with it the need for much lighter pressures lest the bracket's bonding would break. (1975)

Thus the "modern era" in orthodontics started in the 1970s and still is undergoing change!

29. Scientific Evaluation of Mandibular Posturing Methods (Still Debated)

Seventeen different groups of patients, treated with varieties of forward posturing devices, have been studied either in short range (during immediate post treatment) and long term duration (10 years). The findings, during active treatment, have revealed a subtle opening bending of the corpus–condylar axis angle. This behavior yields an increased Pogonion–Condylion dimension compared to controls. Almost as soon as it is produced, the form reverts to a normal pattern of development. **(Fig. 27 A & B)**

It may be difficult to detect without the Ricketts detailed core references. The same change can be elicited by elastics with 200 to 250 -grams per side and leads to a false sense of correction with all techniques.

No Evidence of Growth Activation with Mandibular Propulsion

In longer range, there is **no** evidence that has been found to suggest an improvement of either mandibular size or its position in the face from the posturing forward techniques. In fact, **some samples appear to be slightly inhibited in vertical ramal development** and chin position. These are revealed from a comparison of controls with the predictions and also from a comparison to controls of development without treatment. (See Fig. 27 A & B)

The results do suggest a later remodeling of the maxillary complex in the long-term samples after mandibular posturing as shown by Dr. K. Faltin. The immediate clinical successes are due to tooth movements. A combination of many small changes together with a change in function--**not growth stimulation** of the mandible accounted for the changes

It is ironic, however, that perhaps a downward and backward force on the ramus provides a better growth input. Such action is produced by cervical traction if it is not abused. The continuous force was overwhelming. The large error was in the assumption that inter-maxillary elastics used 24 hours per day would be correct for extra-oral traction. Ten hours of wear at night for these devices was desirable.

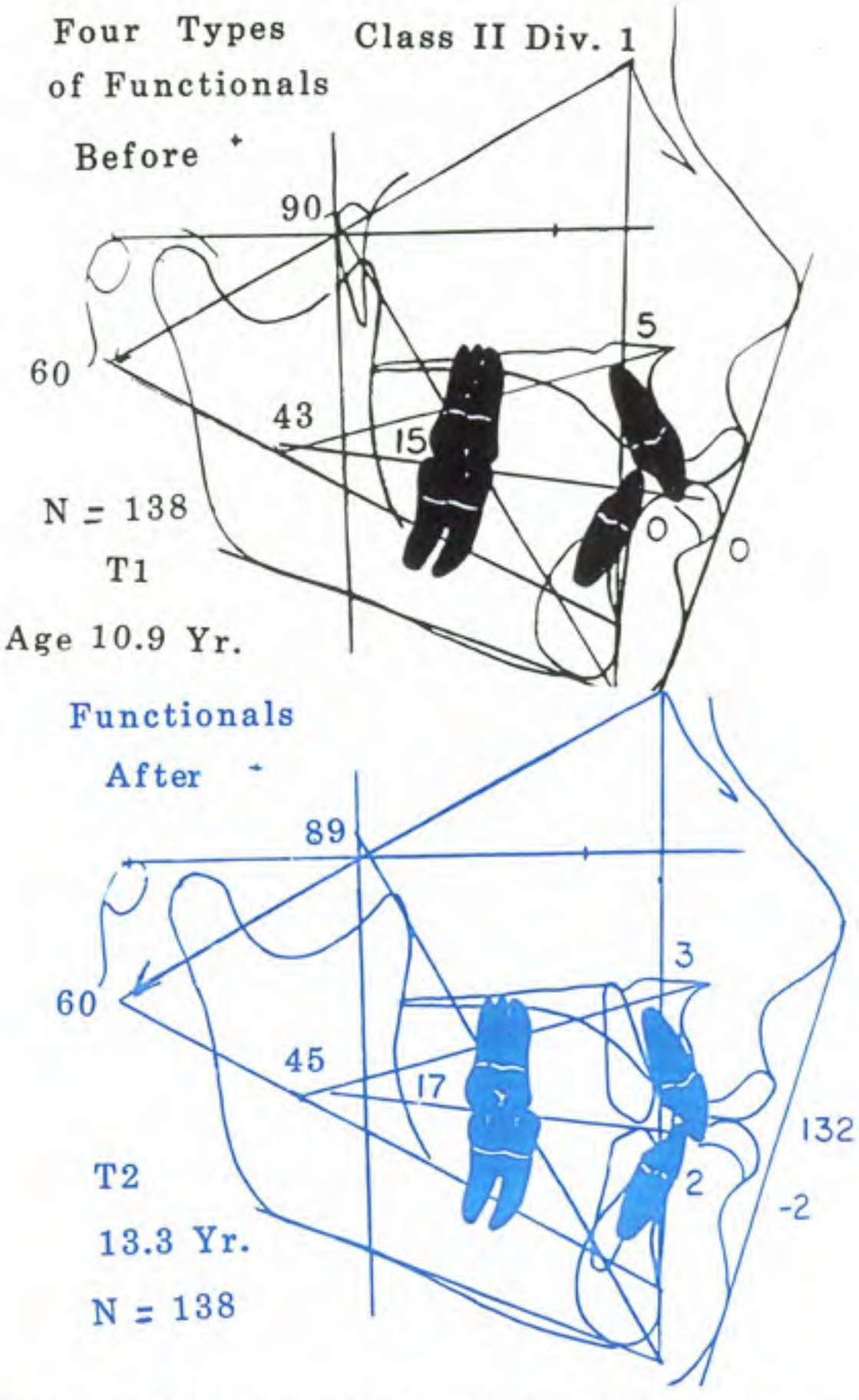


Fig. 27A. A composite of N = 138 Class II patients having received Activators, Bimlers, Frankels or Bionators. TI shows deep bite Class II. T2 is 2.5 years later. Facial Axis opened one degree but general result was good but not due to the propulsion of the mandible.

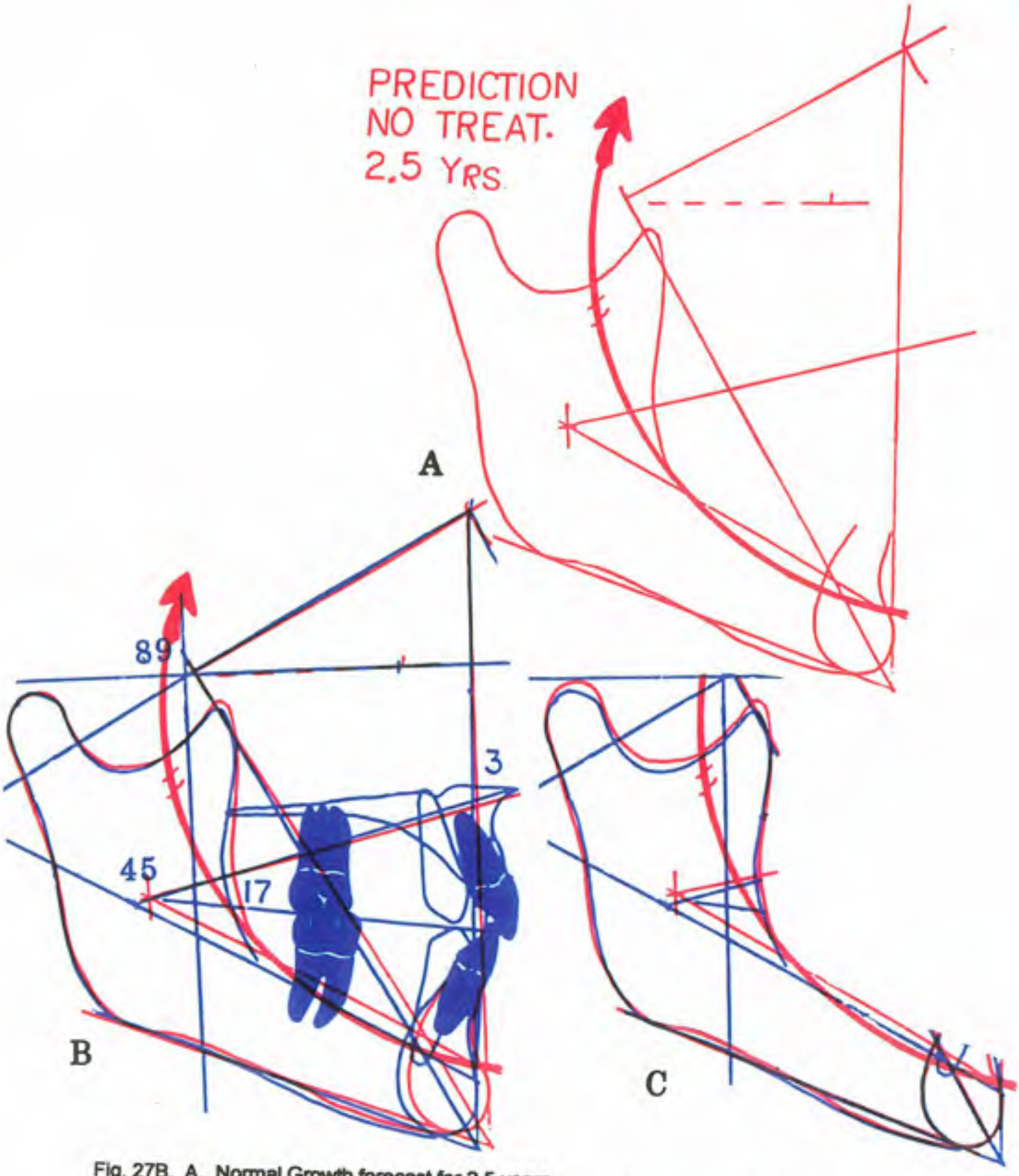


Fig. 27B. A. Normal Growth forecast for 2.5 years
B. Superimposed on Nasion on Basi-cranial axis shows slightly shorter chin in treated sample. Red (forecast) Blue (actual)

30. Condemnation of High Pull (Face Bow Traction)

When the overuse (in time) and improper application (in amount and auxiliaries) of cervical traction led to severe rotational problems in the mandible, the "high pull craze" developed in the 1950s. It gained popularity with the idea of the 'wedge effect.' The conclusions that a "high pull" would prevent opening and swing the mandible forward, however, were premature, ill founded and not scientifically derived.

By contrast to cervical pull used at night only, studies of patients with high pull revealed that the loss of posterior support by upper molar intrusion could cause condyle compression. **Inhibition of vertical condylar and ramal growth was measured to be statistically significant** by Baumrind (1981).

However, for gummy smiles a fifty-gram light high pull assistance when augmenting an upper utility arch for incisor intrusion is accepted. It should not exceed 50 grams per side as attached at the midline as suggested by Jarabak. Maxillary incisor intrusion must also be considered in the light of future aging and lowering of stomion.

Earlier, several factors were listed as contraindications for the high pull theory. Following many detailed studies, the negative factors added up to twenty-two. The findings were so profound that high pull became completely condemned by the author. The reasons are listed together with minor comments and are divided into five categories.

CONTRAINDICATIONS FOR HIGH PULL FACE BOW

Management

1. Dangerous because pull is directed toward the eye.
2. Requires 20-hour wear for comparable changes with cervical at night only.
3. Daytime use is embarrassing (compliance)

Maxilla

4. Restricts growth of naso-pharyngeal airway space (which is already often distressed).
5. Often employed at permanent dentition age when "orthopedics" of maxilla is more limited.
6. Force is at more direct perpendicular to sutures (while cervical pull is at "oblique" directions).
7. Often employed with an arch wire, which restricts total palatal orthopedics.

Mandible

8. Produces (on average) an opening of Facial Axis thereby producing an opening rotation rather than closing.
9. Decreases vertical growth of ramus.
10. Induces an occlusal plane upward posteriorly which:
    a. decreases effective lift of the eminence in function
    b. Invites contra-lateral interferences in function.
11. Disproves the wedge effect theory.

Joint

12. Produces an absence of posterior dental support, which leads to direct condyle compression, which in turn inhibits vertical condylar growth. These consequently produce further hyper-divergency.

13. May kindle a posterior-superior condyle displacement.

14. Mandibular displacement posteriorly is the first cause of disc luxation and subsequent clicking.

15. A posterior positioned condyle may lead to function on retro-discal pad.

Teeth

16. Upward and backward movement of upper first molar restricts space for molars.

17. The use of concomitant arch wire may extrude upper anteriors or put them in a "rabbit" position.

18. Permits further supra-eruption of lower molars when they already are commonly too high in Class II conditions.

19. Tipped occlusal plane makes it necessary to **employ "de-torqued" brackets on the lower incisors.**

20. Places lower arch in **weak anchorage position** for intermaxillary traction (relative to external oblique ridge).

21. Without lower anterior intrusive action first, the upper incisors may produce functional interference, which leads to mandibular rotation backward.

22. Often employed with non-expansion theory and thereby invites a higher percentage of extraction.

31. Confirmation of Root Ratings for Pressure

Pressure, by definition is force per unit area. Several studies have shown that the ligament stretches, and Storey found that the tooth is against the bone of the socket within eight minutes of compression—even directly vertically. Therefore, ligament is a very temporary source of anchorage.

The **area under concern in anchorage is the root surface exposed to bone** in a direct line of movement.

Experiments led to the conclusion that one gram per square millimeter of root surface is a basic reference for movement within the "septum" of alveolar bone. The septum is the cancellous area that separates the outer and inner compact bone or cortical plates.

Thus, forces for movements within the "trough" (or septa) were calculated from the cross section of the roots of the permanent teeth in the direction of movement. **(Fig. 28)** The area of each deciduous tooth, was "averaged out" as a starting reference. **(Fig. 29)**

Modifications

If cortical bone, either lamina dura or external plates of the alveolus, is to be modified, the **pressure is reduced one-half. Pressures are 50% reduced for modification of the "ridge."**

It must be understood that stimulation for the outside of the ridge takes place at the periosteum. For ridge change the pressure is cut in half or 0.5 grams per mm^2. If, on the other hand, anchorage is to be produced by the process of sclerosis of the membrane and the bone trabeculae, the pressure rate is doubled or tripled.

In essence, these scales, reconfirmed by several studies, lead to remarkably more, lighter forces than thought possible particularly for expansion.

The rating scales prove to be marvelous guides for extraction procedures. For instance, canine retraction requires 75 grams of continuous light force. An old fashioned tieback could be over 1000 grams. No wonder anchorage was lost on a wholesale basis in extraction treatment.

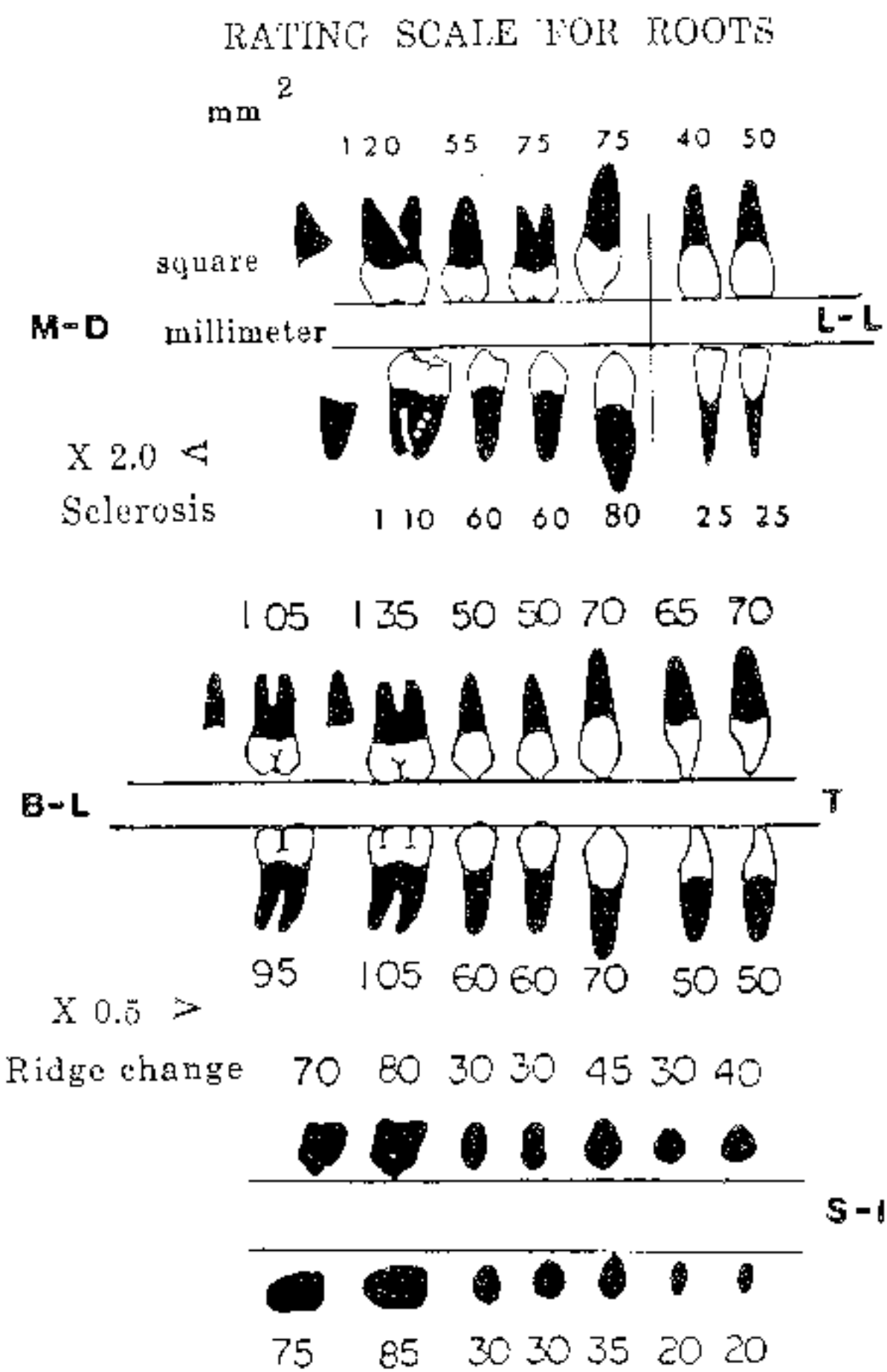


Fig. 28. Mean ranking of root surface presentation in three dimensions for permanent teeth, sagittal, transverse and vertical. Rotation equals sagittal data.

ROOT RATINGS

for Deciduous Teeth

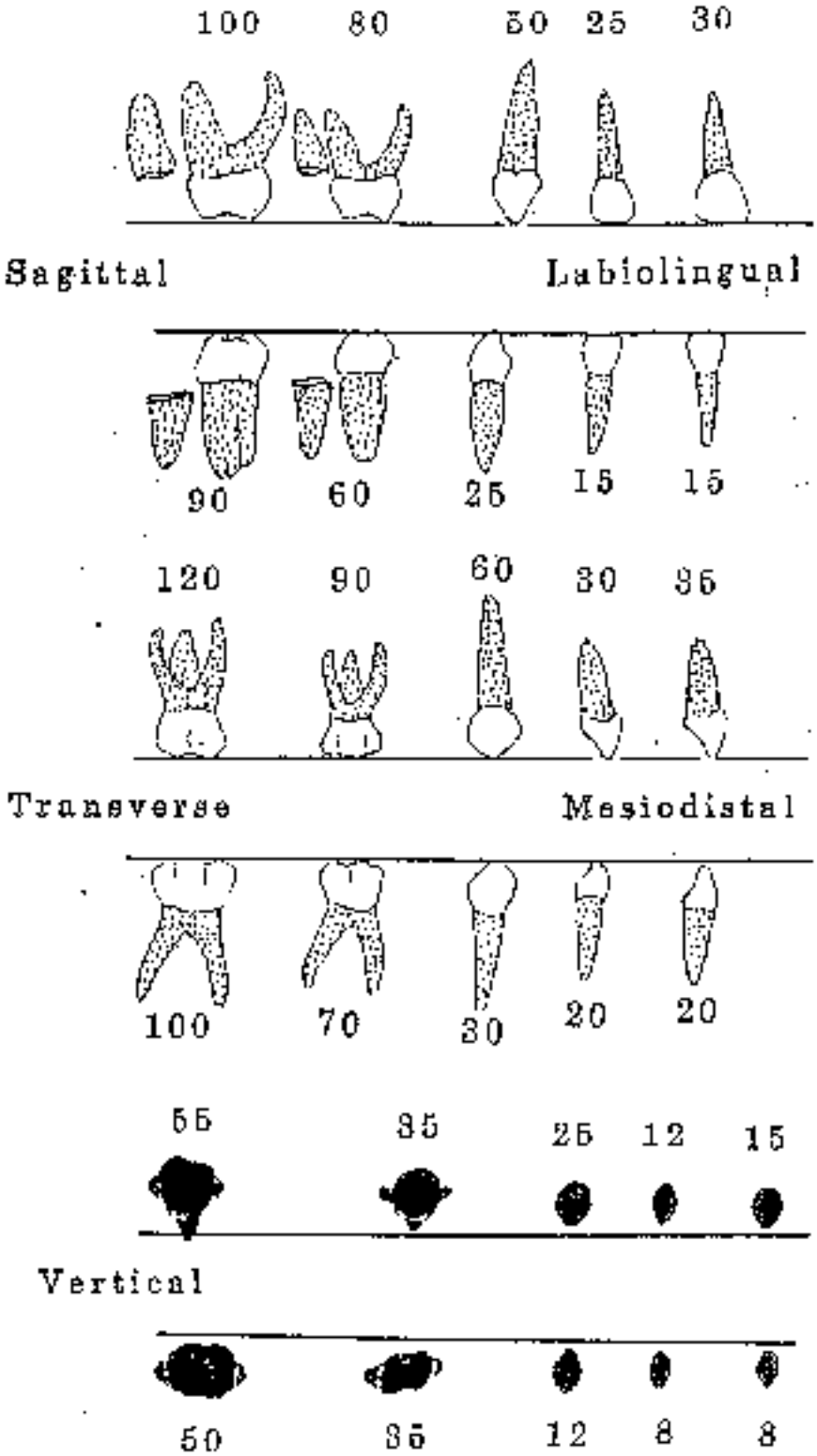


Fig. 29. Calculations for values for deciduous teeth. Note more resistance of deciduous molars than premolars. (compare to Fig. 28)

32. The Advent of the .0457 mm (.018") slot and .0406 mm (.016") Square Wire (A further reduction of (.017") or .43 mm. slot was designed)

Orthodontists in the 1950s sought cheaper wires as gold escalated in cost. In addition, heavier forces with steel wires came to be employed quite commonly. Even double torquing keys were advocated for use with the .0215" x 0.25" rectangular steel wire. These heavy forces were a great part of a complex which led to the 'Doctrine of Limitation' as appraised currently.

The development of "Siamese" bracket design reduced the distance between proximal brackets. This increased the effective force in the same wire used with the single bracket. At the same time studies indicated the need for both lighter and more continuous force applications.

The answer lay in the development of smaller square wires for provisions for three-plane control. The bracket slot rationality had to be reduced. After three years of experimental work (1955 to 1958), the decision to use a .46 mm slot (.018") was made by the author in collaboration with Dr. Cecil Steiner and Dr. Howard Lang. Also, after another two years of clinical research, the blue Elgiloy .406 mm (.016") wire was found to be the most ideal **when all factors were considered.** (1960) **(Fig. 30 A)** Intra-oral adjustment was one of the conditions but delivery of force from molar to incisor was another.

Even with lighter wire, loops were still required to **further lighten the loads and provide for three-plane adjustments to be longer lasting**. The smaller bracket and smaller wire led to greater clinical efficiency

The result was also a system of pre-formed wires and modules for assembly and application at the chair. All this shortened visit time and provided still greater efficiency. The skill for intra-oral adjustment replaced many arch changes. These movements occurred at the same time that sectional mechanics and segmented control was developed. **(Fig. 30 B)**

As even more resilient wires were developed, fewer loops were required, but loops still were best when extensive three-plane movements were necessary.

Maxillo-mandibular skeletal change followed by automatic improved function continued to be the first priorities. "Straight line" was to be used for the details of finishing and was in fact the third stage in the planning matrix.

CAPACITY OF THE .40 mm x .40 mm ELGILOY BLUE

2000 gram mm of moment

LENGTH	FORCE OF BENDING
@ 40 mm	+ 50 grams
@ 35 mm	+ 60 grams
@ 30 mm	+ 70 grams
@ 25 mm	+ 80 grams
@ 20 mm	+ 100 grams
@ 10 mm	+ 200 grams
@ 5 mm	+ 400 grams
@ 4 mm	+ 500 grams
@ 3 mm	+ 600 grams

values rounded off for clinical use

double delta –36 mm

40 mm of wire

- 40 mm *double open "T"*

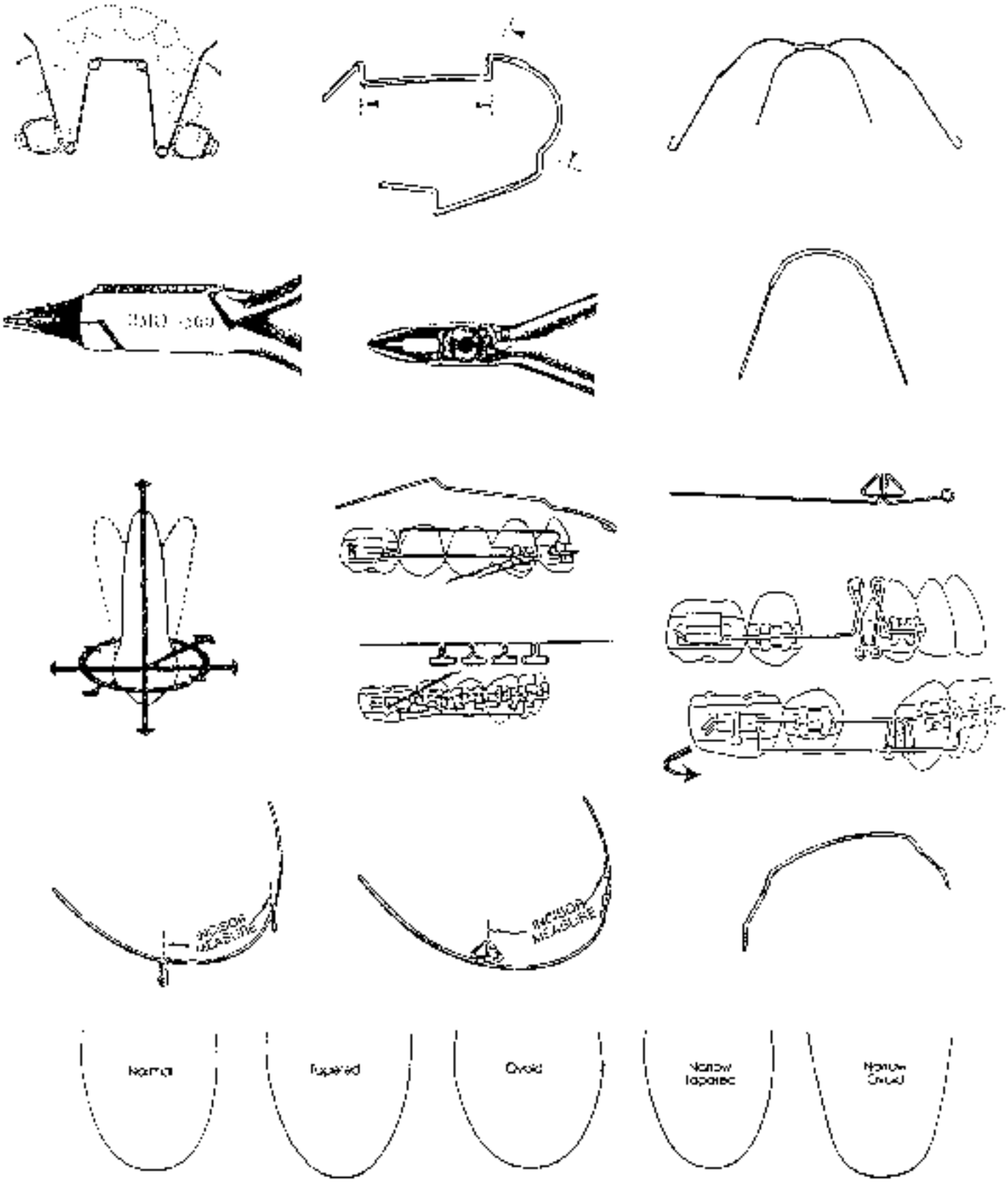
- 35 mm *utility*

- 20 mm *open "T"*

- 16 mm *closed elix*

- 15 mm *crossed "T"*

- 8 mm *back action elix*



326 One page view of a number of arches modules and auxiliaries employed by Ricketts. 84

33. The Facile Formula for Tubes and Brackets

Pre-adjustment started with the systematization of angulation and torques placed in the brackets mounted on preformed bands in 1956. Steps had been bent into the arch wire for the tooth thickness differences. These details in the ideal arch differed from traditional teachings in a significant manner. **(Fig 31A)**

As developments occurred, plastic ligation was developed. Later, by 1975, bonding was perfected. The stage was set for further "pre-adjusted" refinements. In the late 80s the author precipitated twenty-seven different studies on normal tooth relations. Techniques were changed further, and a new order was established which was labeled the Facile (easy) Formula.

As a secondary and a vital movement towards a "therapeutic ideal", hundreds of patients were recalled ten years or more after retention. These became feedback information for further bracket designs. In other words, attempts for the prevention of relapse was built into the design.

The Facile Formula, consequently, has a history of a half-century of study. The design takes in factors of anchorage, requirements for typical over-treatment and movement management together with the esthetics of the smile as well as stability.

The Pentamorphic arches account for the variations in the arch forms (1976). Over one hundred non-treated patients were employed for measurement. Twenty unusual treated patients ten years stable in order to derive the five clinical forms. The same form was found, ironically, for both arches. (See Fig. 10A, Part II)

For the Facile Formula, bracket thickness was reduced. This was done to prevent lip irritation and gain still better control by purchases closer to the tooth. Because .0406 blue Elgiloy (.016") wires became the largest required, a .6096 mm (.024") depth to the slot was found to be ample. In order to reduce some of the play in the wire which seemed to bother some clinicians, the **width of the slot was reduced to .017" or 0.43 mm. (Fig. 31B)** We had discovered that once the incisors were intruded and the canines thread ligated to the level of the first premolar, the 'piggy back' technique was eliminated. A light wire or "T" section could be placed for rotations and angulation control.

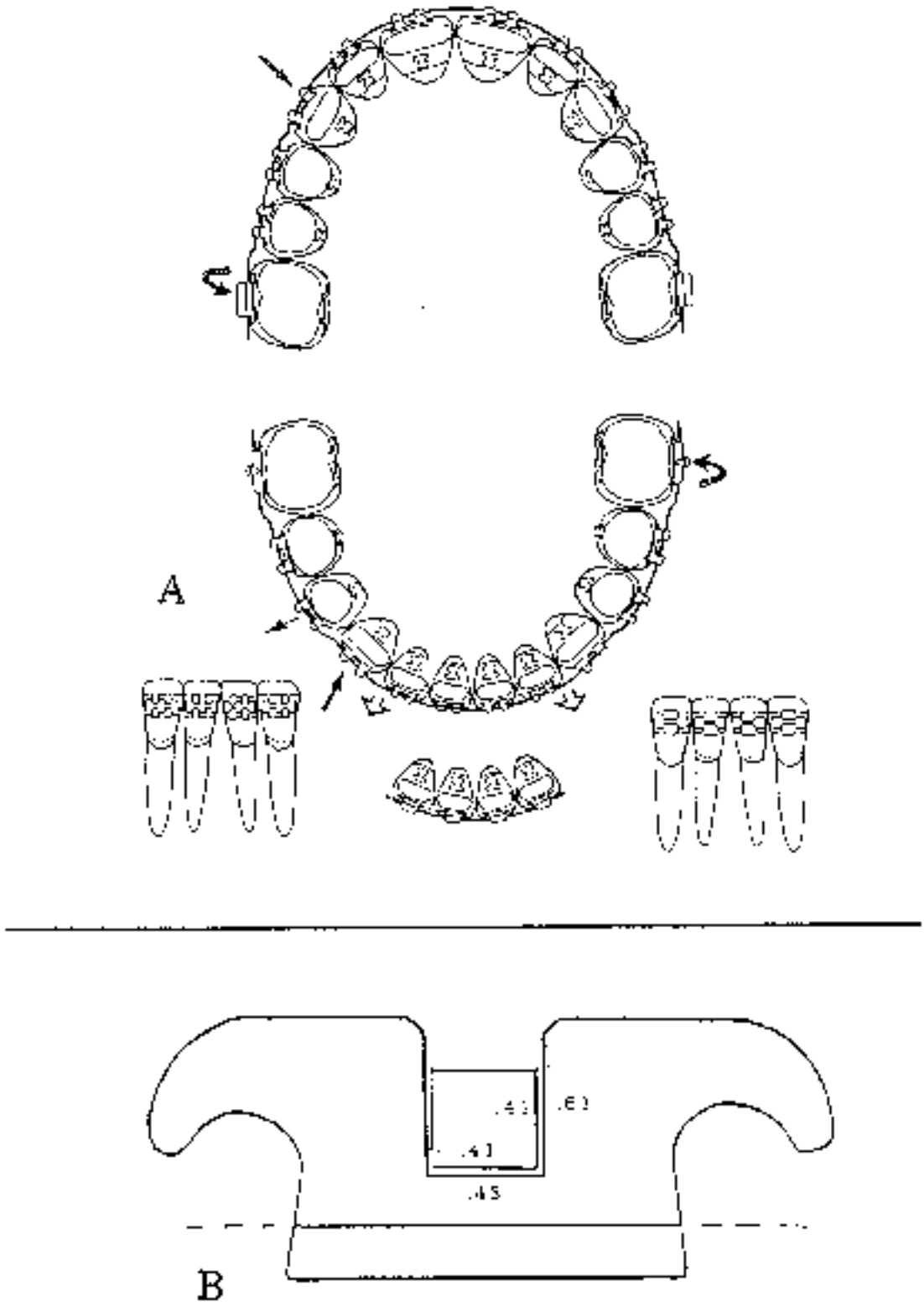


Fig. 31. The original ideal arch forms before pre-adjusted brackets (1950 to 1957). Note the "tucked" canines, bold first premolars and full rotation of first molars.

Requirements of Bracket-tube Designs

Because arches are bilateral and mostly symmetrical, only one side need be considered. For tube or bracket design, five requirements are necessary. These are for height, angulation, torque, raises and rotations.

Height (Fig. 32)

The **height** for the bracket placement is marked from the bracket pad or band edge to the **marginal ridges** posteriorly. The **key** to height is the contact marginal ridge relation. All brackets on the incisors at the pad edge or band edge is placed at uniform heights of 2.5 mm. to the incisal edge, making the **center of the arch wire 4.0 mm. from the incisal edge**. The normal lower canine tip is 3.0 mm from the bracket edge or 4.5 mm. from the slot center.

Wear on the canine is estimated in older patients. The upper canine height is taken from the first premolar mesial marginal ridge.

The upper and lower **second** molars are set for a 2.0 mm. Curve of Spee The lower tube is a gingivalward (for extrusion) and the upper is occlusalward (for depression).

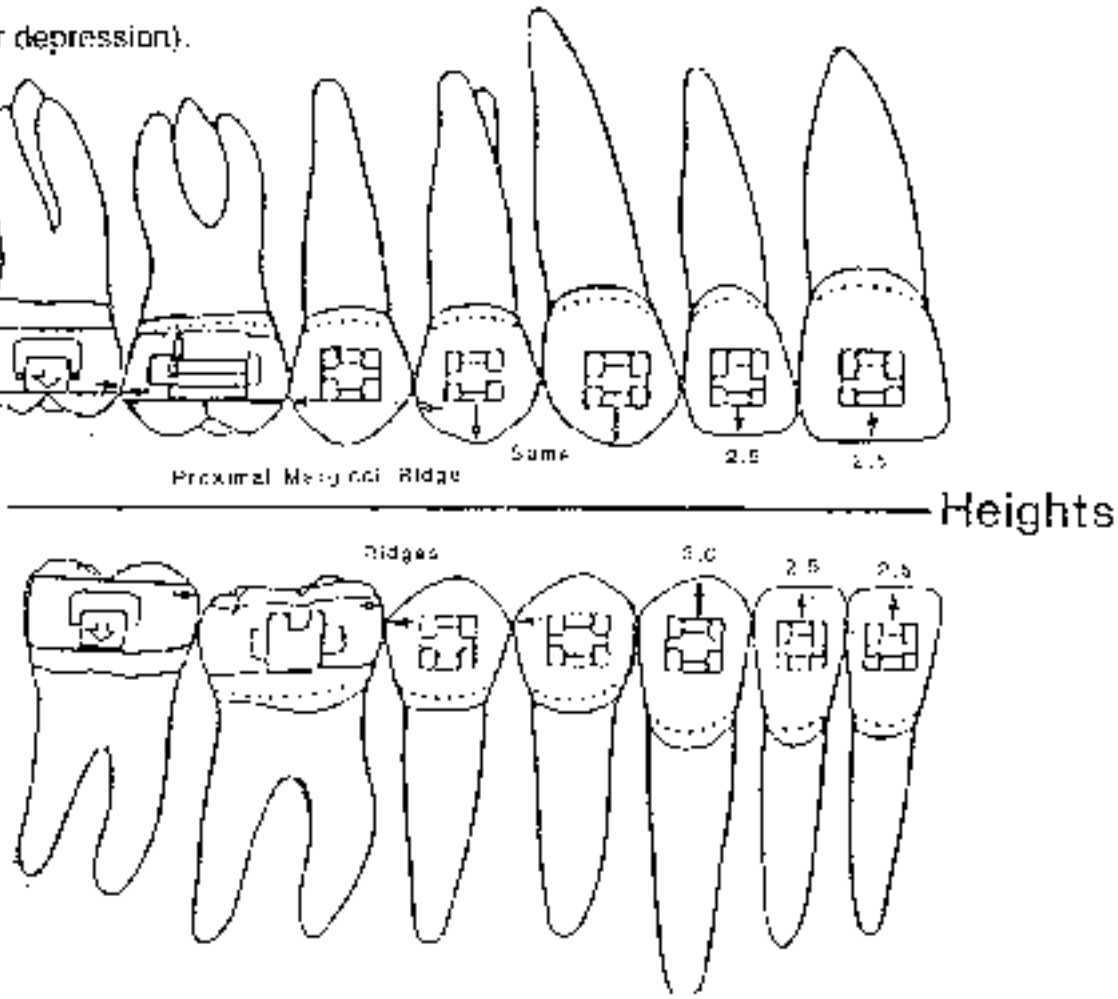


Fig. 32. Technique for establishing height of brackets and tubes.

Angulations (Fig. 33)

The **angulations** are all zero except: the upper lateral at +10°; the upper canine at +7°; the lower canine at + 2° and both lower molars at -5°. The upper centrals are angulated by placement by +2° to 3° and the lower lateral is -2° by placement. This makes it easy to remember for the operator.

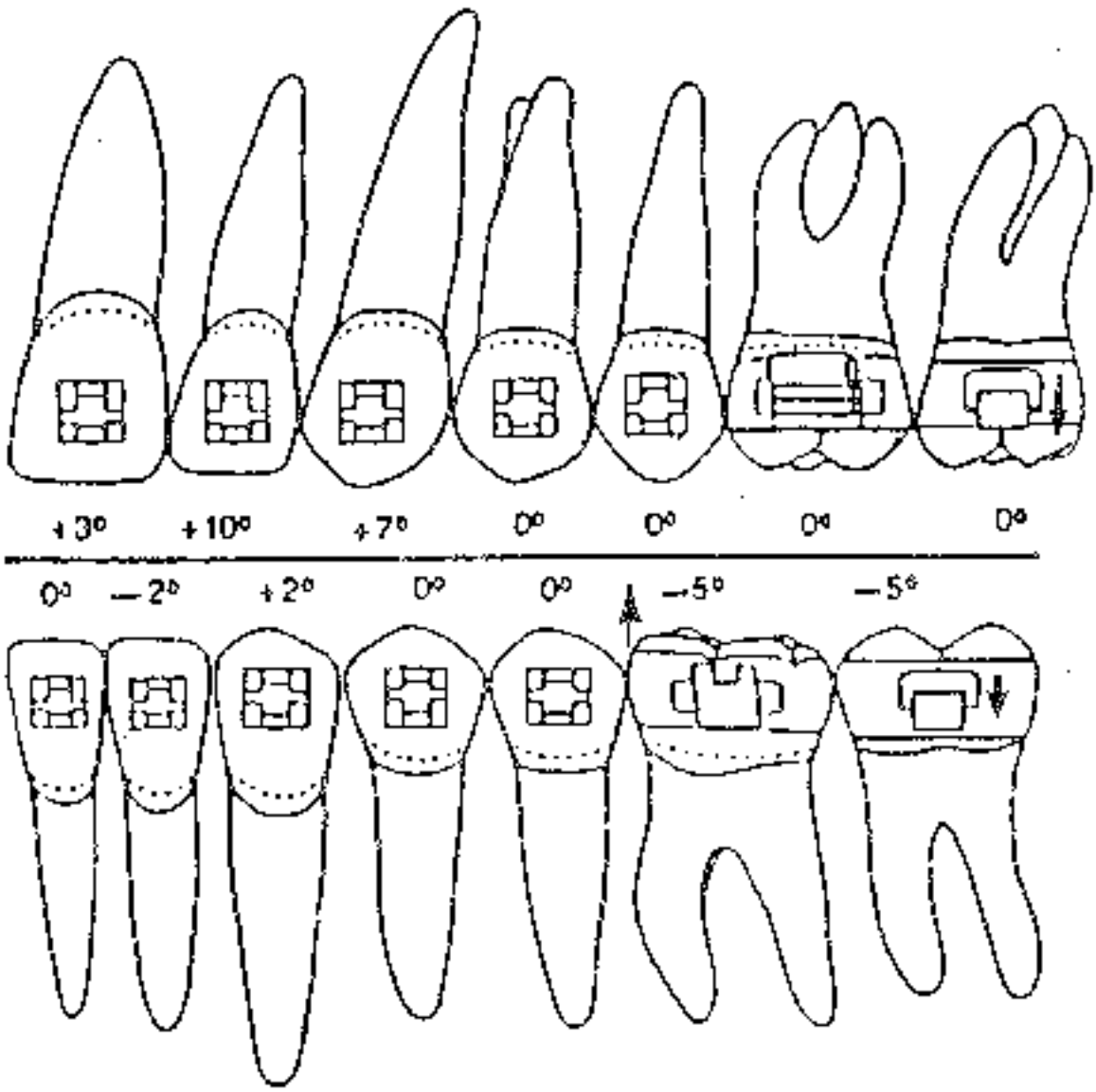
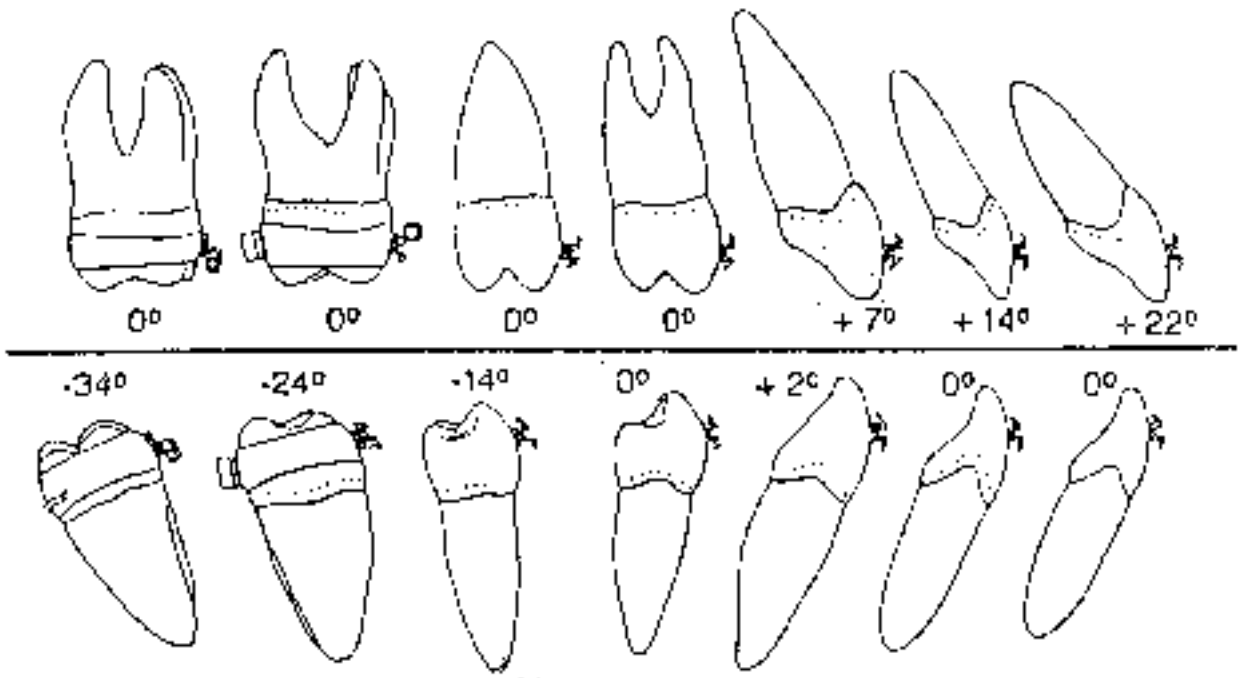


Fig. 33. Angulations. Minus signs are down (gingival) on mesial.

Torques (Fig. 34)

The **torques** on the teeth are zero on all the teeth except as follows: the upper central incisor is best suited at -22°, the lateral is -14° and the canine is -7°. This makes a smooth transition.

The lower canine is, however, torqued only -2°. The second premolar is torqued +14°, the lower first molar is +24° and the second molar is +34°. When the lower third molar is engaged, the wire is torqued for 10 more degrees (or 44°) than the second molar. The lower second molar band is employed on the third molar.



Torques

Fig. 34. Torques Designed with the Facile Formula. Note the 0 torque on the lower incisors and first premolar (non-extraction).

Raises (Fig. 35)

Raises (or horizontal offsets) are the most controversial factor among the various prescriptions of other colleagues. The beginning standard specifications or distance from the bracket base to the bracket slot was 0.7 mm. Ricketts sent these specifications to all bracket manufacturers in 1958. This was maintained for all incisors including the upper lateral. This was found necessary in that many patients revealed lateral incisors to be under-treated in both arches.

The **canines are raised 0.9 mm.** so they can be "tucked in" at the bracket line and over-widening can be avoided for better stability. Upper and lower premolars are raised only 0.4 mm. This ensures a buccal position of the premolar for a vertical stop for the upper canine (contact #6). Second premolars are raised or laterally offset 1.0 mm. Raises from the buccal in the molars are accounted for by rotations starting with 0.7 mm. at the mesial. However, the second molar is off the buccal line 2.08 mm. ± 1.02. **Therefore the tube is raised an extra 1.0 mm** and the wire has a "sweep" of about 1.0 mm in both arches.

Rotations (See Fig 35)

Rotation calculations for the molars have been remarkably correct from the beginning. The **lower first molar** having a 0.7 height mesially is rotated 12° and the second molar 6°. The **upper first molar** starting at 0.7 mm on the mesial is rotated 15°. The upper second, when banded, is also rotated 15°.

A rotation of 8° is placed on the upper first premolar by offsetting the bracket about 1 mm. to the mesial. Studies showed that this was necessary for fitting of the lingual cusp into the distal fossa of the lower first premolar.

All these are starting point figures. There are variations in the form and sizes of teeth and also the bite requirements for over-treatment. These are to be managed by the knowledge and skill of the operator as is well known. The contact stops were numbered so that occlusal detail could be made a science.

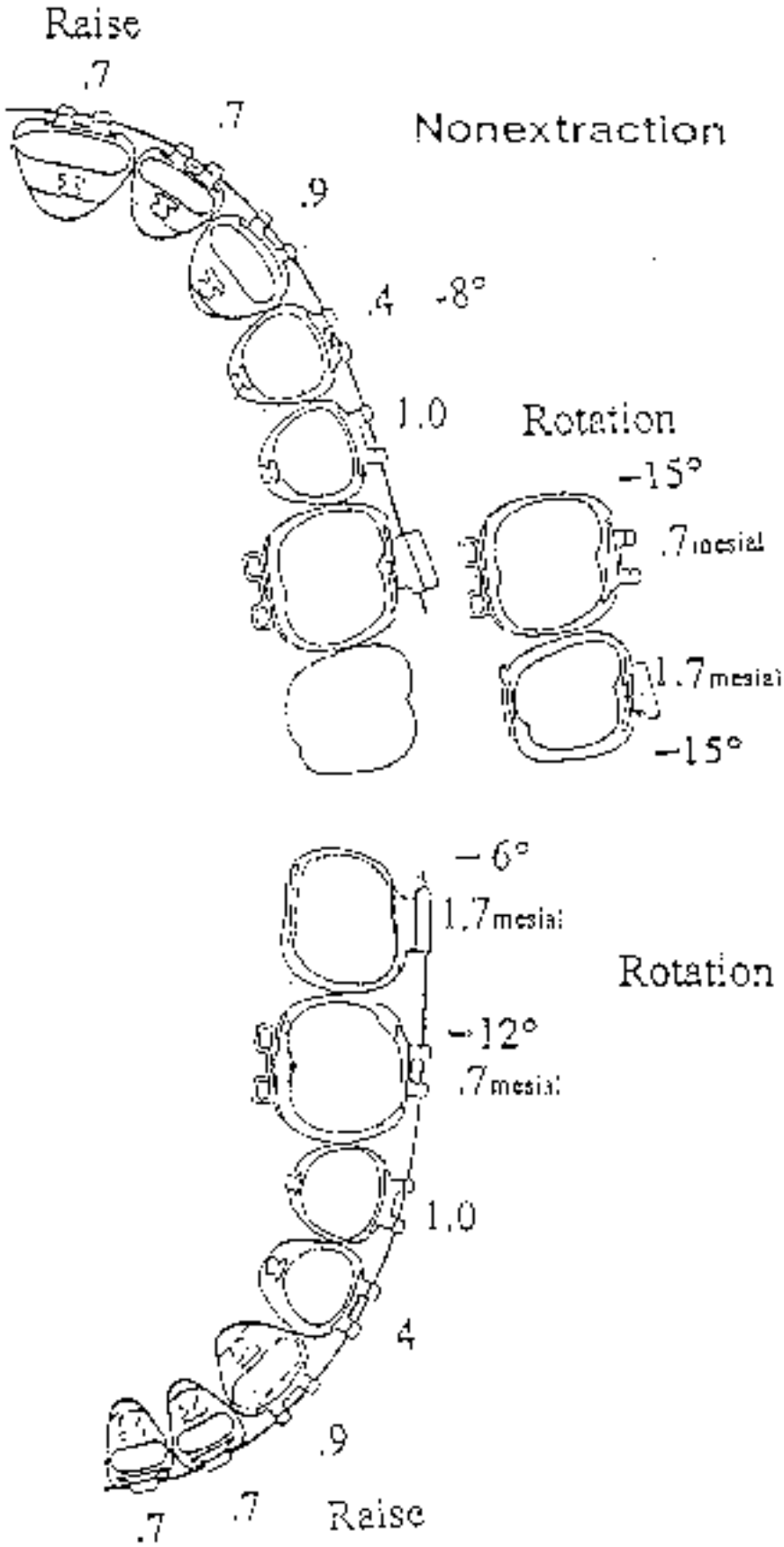


Fig. 35. Raises (horizontal offsets) and rotations built into the attached fittings. Some in and out adjustments may be required for large or misshapen teeth.

34. Why Loops?

Edgewise, as taught by Brodie, was a very assertive belief in the non-looped use of a continuous wire. It was further employed with the hypothesis of intermittent force. The technique originally called for a rectangular wire to be adapted and essentially straightened every two weeks. However by the 1950s, both laboratory and clinical research had showed the advantage of light and more constant force application. This led, in turn, to pressure considerations (force per unit area). It resulted in the foregoing rating scales for roots. It further justified the application of loops.

Several reasons for the use of loops were compiled. **(Fig. 36)** The range of the adjustment was increased while the pressure was decreased. There was a safety limit to the square blue 0.406° mm. (.016" x .016") Elgiloy wire. Loops were also used to shield the lip tension from the gingiva. Loops could be adjusted directly in the mouth at the same time of three-dimensional control. The loop would serve for a tieback, a stop or an elastic hook. Loops made orthodontics a real art and a profound science. The idea of always-straight wire is non-scientific.

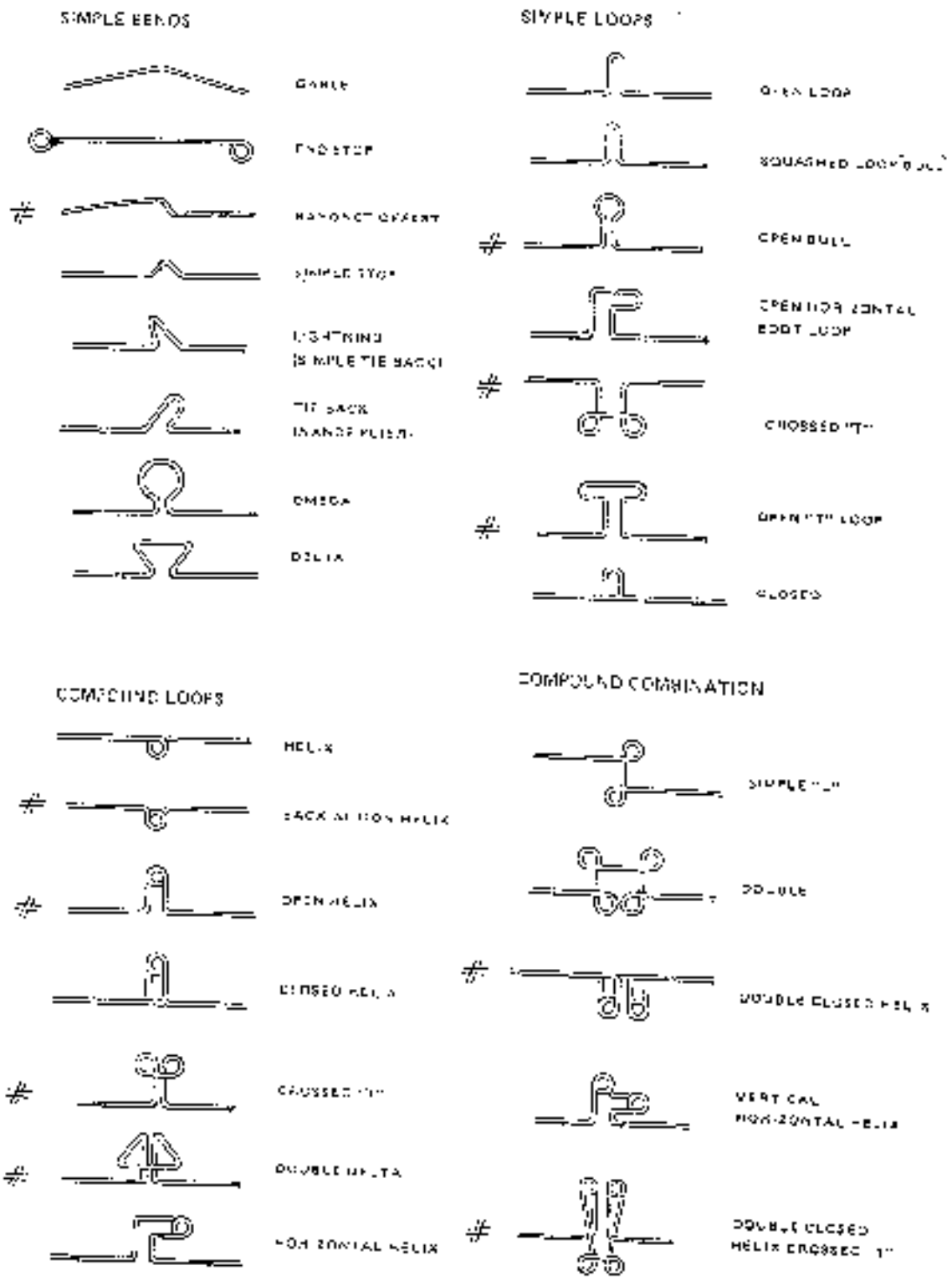


Fig. 36 Loops with labels. The most frequently used are marked with the pound sign (#). Many will apply force in three planes of space. All are made in .41 mm square blue Elgiloy.

35. Two Band Orthodontics

Quite serendipitously, certain patients treated in the deciduous or the early mixed dentition were found to be remarkably corrected through the use of only two bands. These were used on the upper second deciduous molar before age 6 or the upper first permanent molar after age 7. In many patients, no further correction was found necessary at the later permanent dentition phase following the correct use of the face bow with cervical traction. **(Fig. 37A, B & C)**

In other patients of Class I, II or III variety, the quad helix was exceptional for maxillary expansion and some distalization of upper molars. For Class II if the "quad" is employed first, it is cut and taken out and extra-oral cervical traction is used to complete the orthopedics. In the event of good lower arches, no further treatment has been found to be necessary quite often.

Also, the "quad helix" is employed for Class III. The "face mask" elastics are crossed over the tongue and applied to the palatal posterior loops. **Over-treatment, not stabilization alone is the rule.**

Two Molar Anchorage

It is difficult for some clinicians to believe that two upper second deciduous molars can be employed alone to affect a whole maxillary complex skeletally. The secret is that pressure in the range of two to three grams per mm will sclerose the attachment area, and the force will be transmitted to the sutures. The force employed in the deciduous molars is 300 grams (or 150 grams per side). For the mixed dentition, the force is 500 grams (or 250 per side). The extra-oral traction is preferably to be worn at night only. **Full time wear may unnecessarily force the mandible open.**

Deep bites, however, often require lower utility arches first. Fixed ramps on the quad helix, however, can prevent deep bites from developing when applied at age five. Still, the treatment may require only two bands.

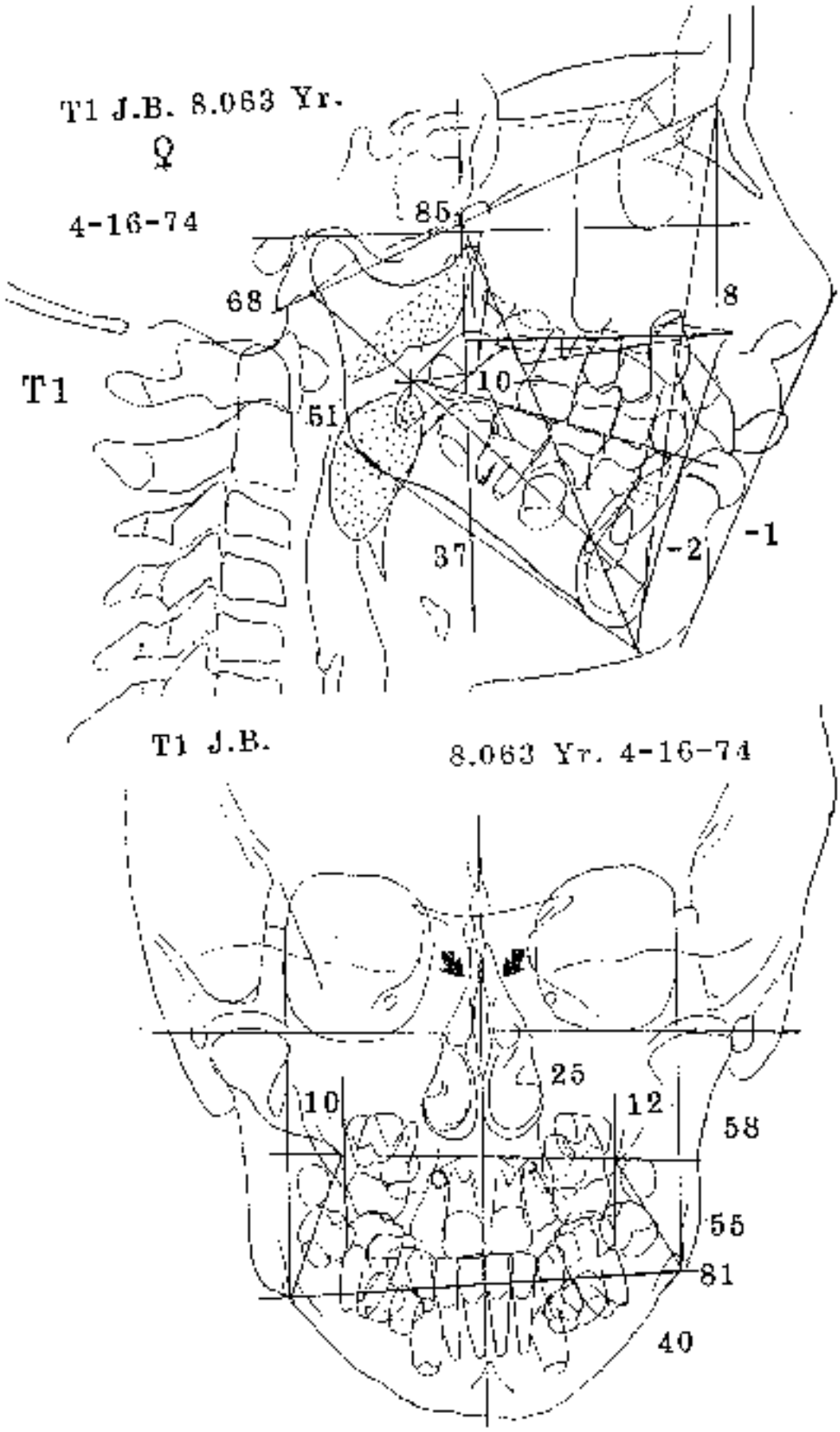


Fig. 37A. Patient with high mandibular plane and open bite treated with quad-helix followed cervical extra-oral traction. Note adenoid and tonsil blockage which had led to a pseudo Class I and flattening of right condyle

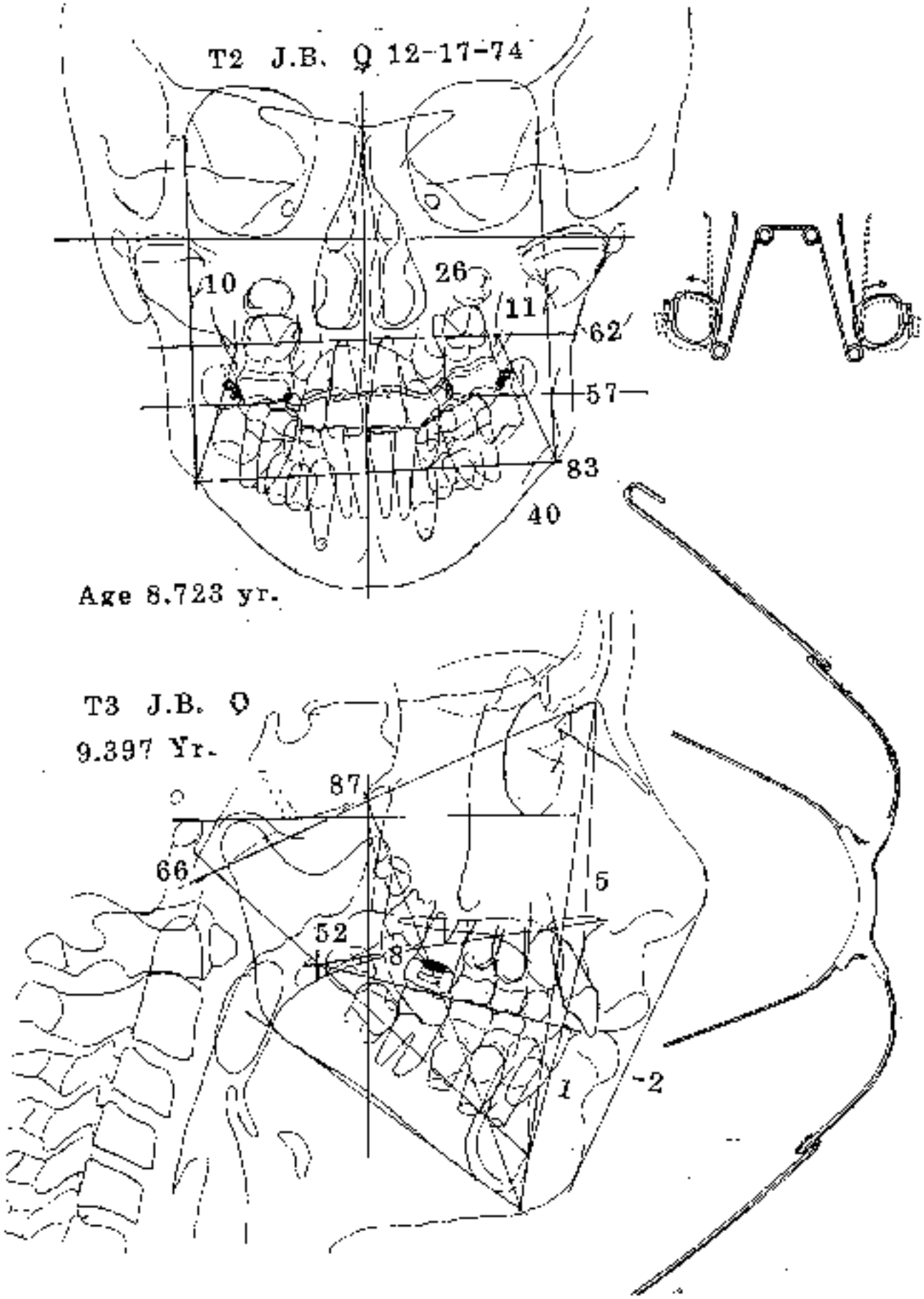


Fig. 37.B. Quad-Helix was used for 6 months (A). The cervical traction face bow was employed to the progress shown at 15 months. No other treatment was required –not even a retainer.

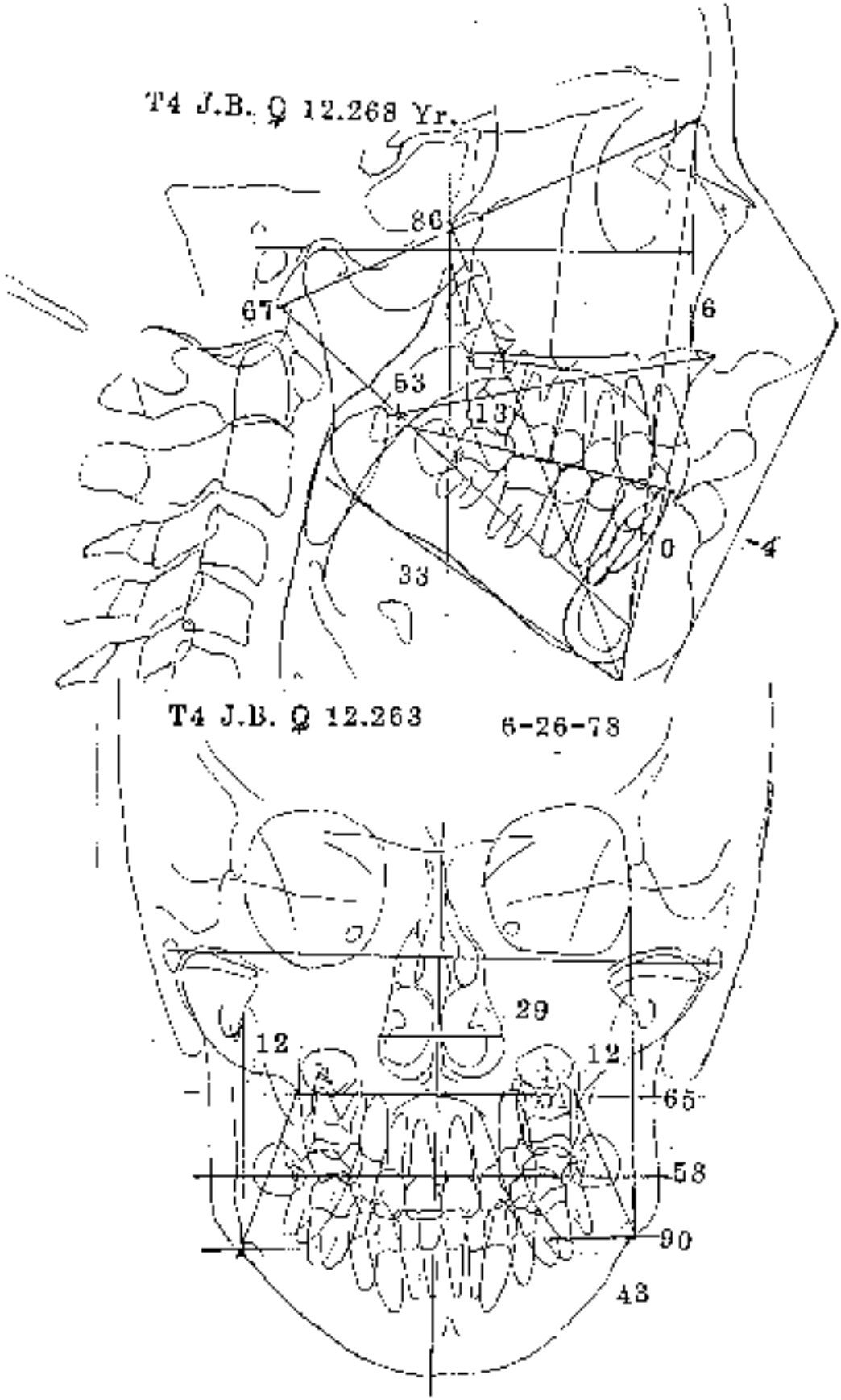


Fig. 37C. Patient J.B. needed no second phase.

36. Staging in Mechanics: The Matrix

The edgewise system was originally promoted with the idea that all treatment could be accomplished simultaneously and in a matter of only three months. It met with ultimate failure. This gave rise to the thinking of a need for a plethora of extraction. It also became promulgated on the belief that nothing more than dento-alveolar change could be accomplished. We found that treatment applied in sequences worked much better than straight wire.

In 1976, the author formulated a standard matrix on which to plan mechanics. The priority was on (1) skeletal transformation and (2) mandibular auto-rotational control. The matrix consisted of four main stages with two steps in each stage. It has remained to be an excellent logic for carrying through anchorage programs and producing the objectives set forth in the VTO and VTG.

THE MATRIX

COMMENCING

CONTINUING

CONSOLIDATING

COMPLETING

} BIOPROGRESSIVE

} STRAIGHT WIRE

	STAGE		STEPS
I	COMMENCING	1.	Starting Procedure
		2.	Carry out
II	CONTINUING	3.	Intra-arch Regulation
		4.	Inter-arch Correction
III	CONSOLIDATING	5.	Integration and Torquing
		6.	Idealization and Co-ordination
IV	COMPLETING	7.	Finishing and Over-treatment
		8.	Retention and Stabilization

37. Sectional Mechanics and Cortical Anchorage Control

A continued problem clinically was the avoiding of **extrusion** of the incisors together with the elevation of the lower molars during inter-maxillary traction for the condition of Class II. Leveling procedures with reverse curves and straight wire left much to be desired. Problems encountered to wit:

1. The lower incisors in deep bite will not intrude significantly.
2. The setting in competition of the entire lower arch against the upper arch was poor logic even with the use of second order bends.
3. The distal movement of the complete upper arch was counter to its natural development.
4. Elastic traction on the lower arch was consistent with its natural eruptive pattern and tenced to move it forward.
5. But, finally it was discovered that the most dramatic factor for mandibular rotation backward was Incisor interference. This was the condition that produced the first principle in Bioprogressive: to treat the overbite before the over-jet and keep the arches unlocked. **(Fig 38)**

In 1954 two developments took place. It was discovered, in the Ribbon arch treatment of mixed dentitions, that very little slippage of the lower arch had occurred. It was noted that the roots were torquing buccally and at that age, the external oblique ridge was immediately lateral to the first molar. "Toe holding" was therefore conducted in the bucco-lingual direction not mesio-distally as Tweed had recommended. (See Fig. 38C & 39B)

The second change was even more consequential. The difficulty of control of upper extrusion and a need for a lighter "drag" on the lower, led to sectioning of the upper arch. **(Fig. 39)** The beneficial results were immediately apparent Several years of clinical experience and feedback led to a number of sections to be employed.

By combining a "sectioning" method together with "cortical" anchorage, a **whole new possibility doctrine developed**. Class II adults that previously may have been treated with upper extraction alone were now treated non-extraction and with great ease

Sectional mechanics also worked nicely for Class III treatment. Probably it has its greatest benefit in treating buccal cross-bite. **(Fig. 40)**

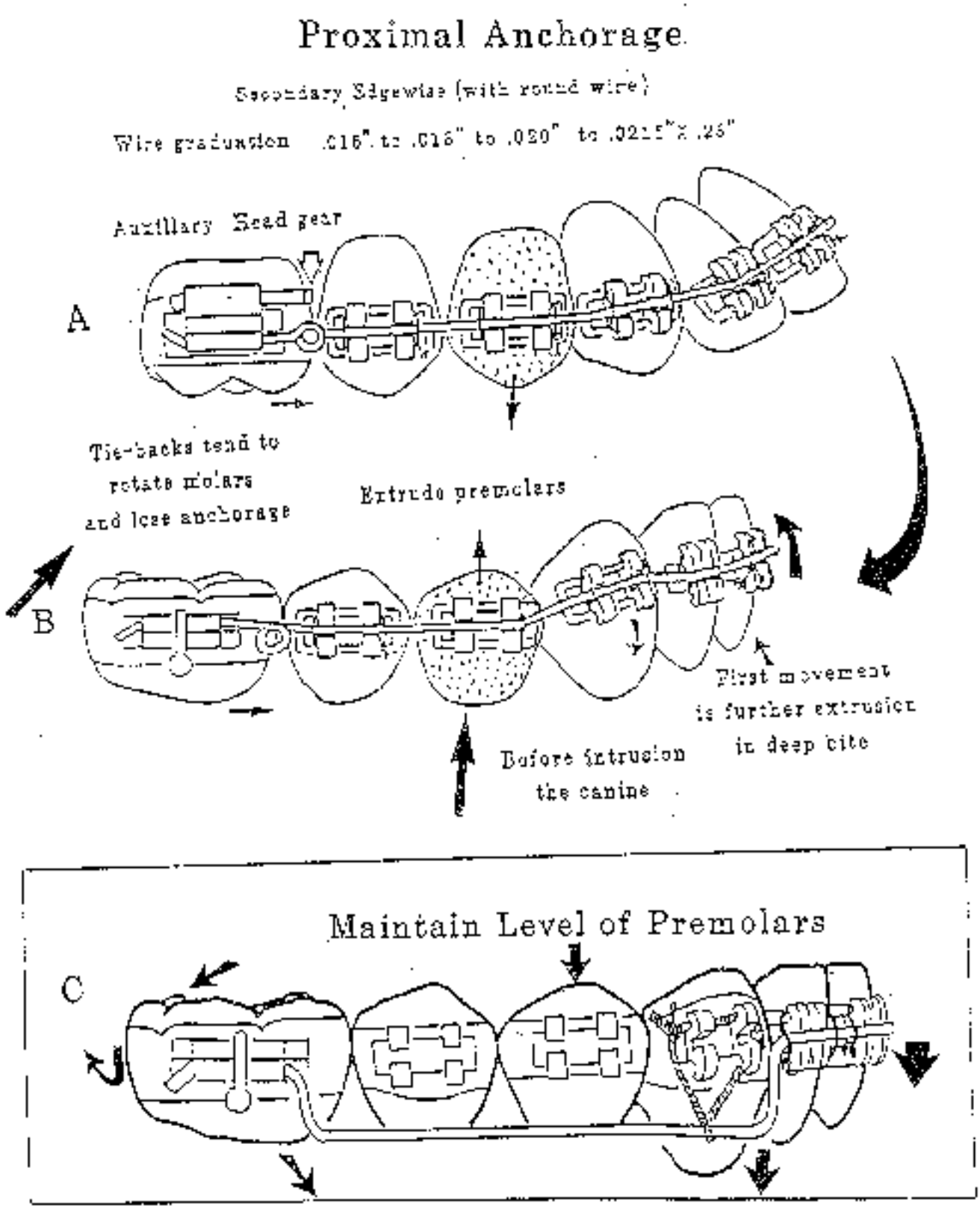


Fig. 38. Problems were enumerated in managing overbites by premolar extrusion and preventing incisor flaring with straight leveling techniques. The upper anterior teeth were extruded and the lower posterior was extruded to produce incisor interference. (C) The technique was changed to seat to the level of the first premolars by anterior intrusion rather than extruding the posterior teeth

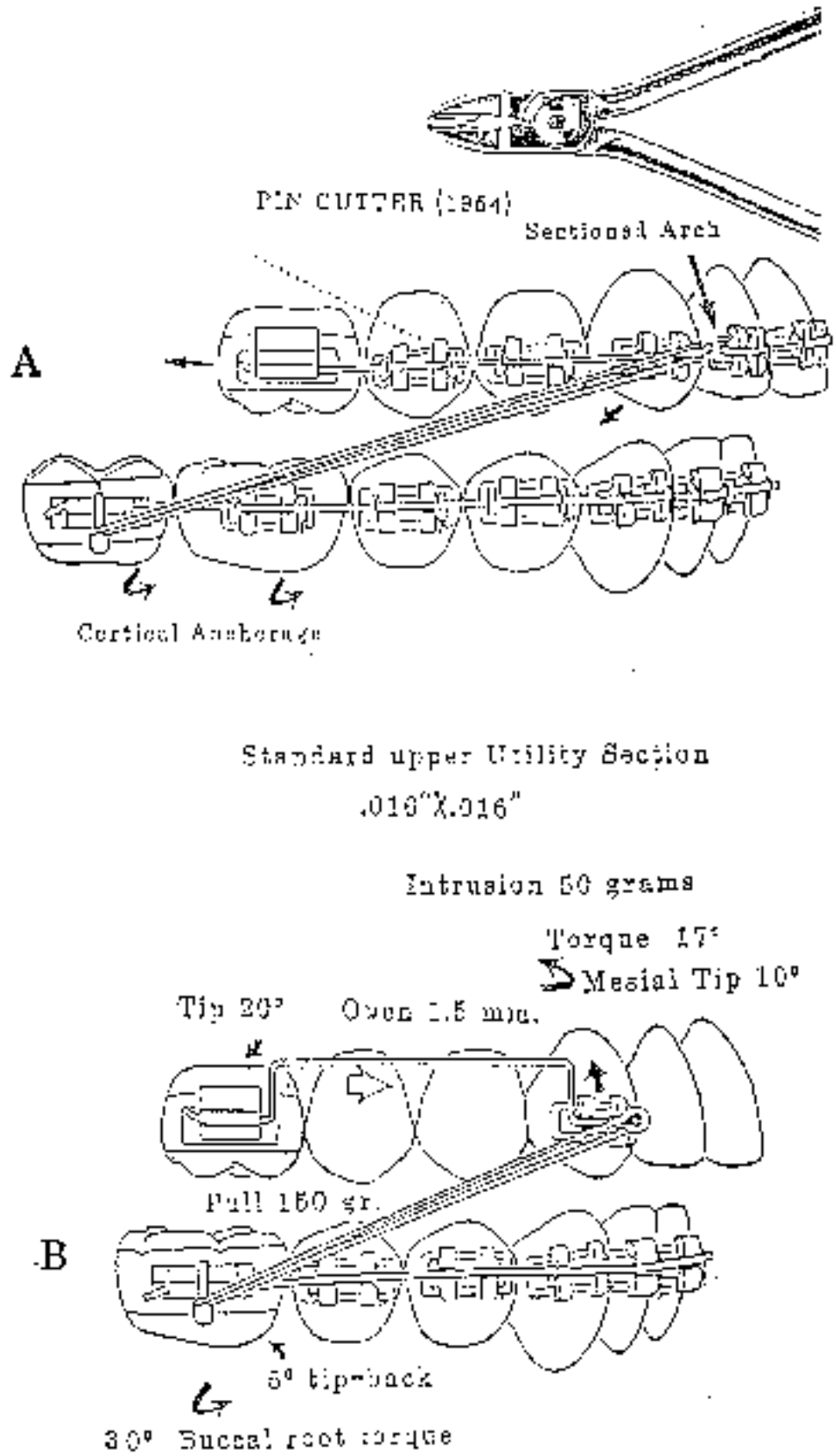


Fig. 39A. The ideal arch was sectioned for anchorage benefits and changed the results obtained.

B. Several sections can be employed but the standard became a simple utility section requiring canine control shown.

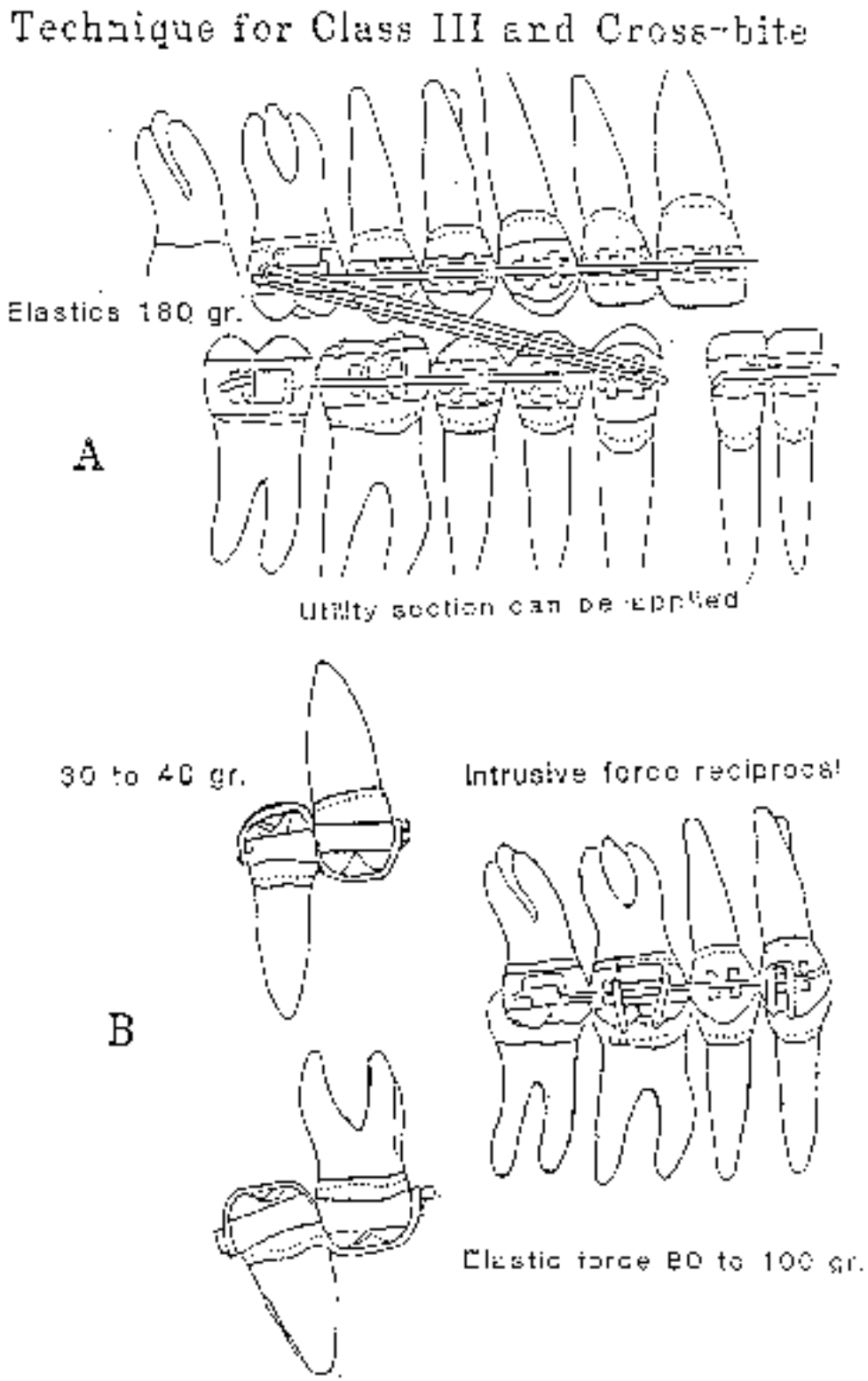


Fig 40A. Sectional mechanics also works well in Class III and asymmetrics.
40B. Sectionals work well for intrusions in buccal cross-bites.

38. **Extraction Mechanics with the Facile Formula**

When a premolar is extracted, there has been a tendency to over-expand canines. This is because a premolar component is missing. Consequently the posterior segment must be contracted in order to compensate for the absence of a tooth. By using the tracing of a normal occlusion and removing the premolars (like a template) the problem is demonstrated. **(Fig. 41)**

Several techniques evolved for corrections following the extraction of premolars. The spur and tieback methods employed with primary edgewise caused posterior anchorage loss and was a major problem. All sorts of reinforcement techniques evolved. Presently, metal implants are being used for anchorage experimentally.

However, with the use of rating scale pressures, sectional mechanics, segmental therapy, and the application of cortical bone sites, anchorage problems were solved. The interpretation of the rating scales clearly indicated that the retraction forces employed were several times heavier than required. **Extra-oral traction is unnecessary** for the achievement of major anterior retraction objectives when the prescribed pressures are emphasized with inter-maxillary traction. Extra-oral traction is employed essentially for skeletal change, by the author.

The first key is that retraction sections be **activated properly**. The second key is bite opening management by interior intrusion from the beginning. The third key is patience with light pressures for the melting of compact bone or *planum alveolare* and palatal plate. **(Fig 42)**

With extraction of premolars, a unit is missing at the transition from the canine to the first molar. Compromises can be made, but, for ideal relations, **steps or bayonet bends are necessary in the arch wire mesial to the molars**. Even yet, a compromise may be necessary in the remaining premolars. The 0.40 mm raises must remain for tucking canines in order to prevent over-expansion. The lower premolar receives a compromise -6° buccal root torque. **(Fig. 43)**

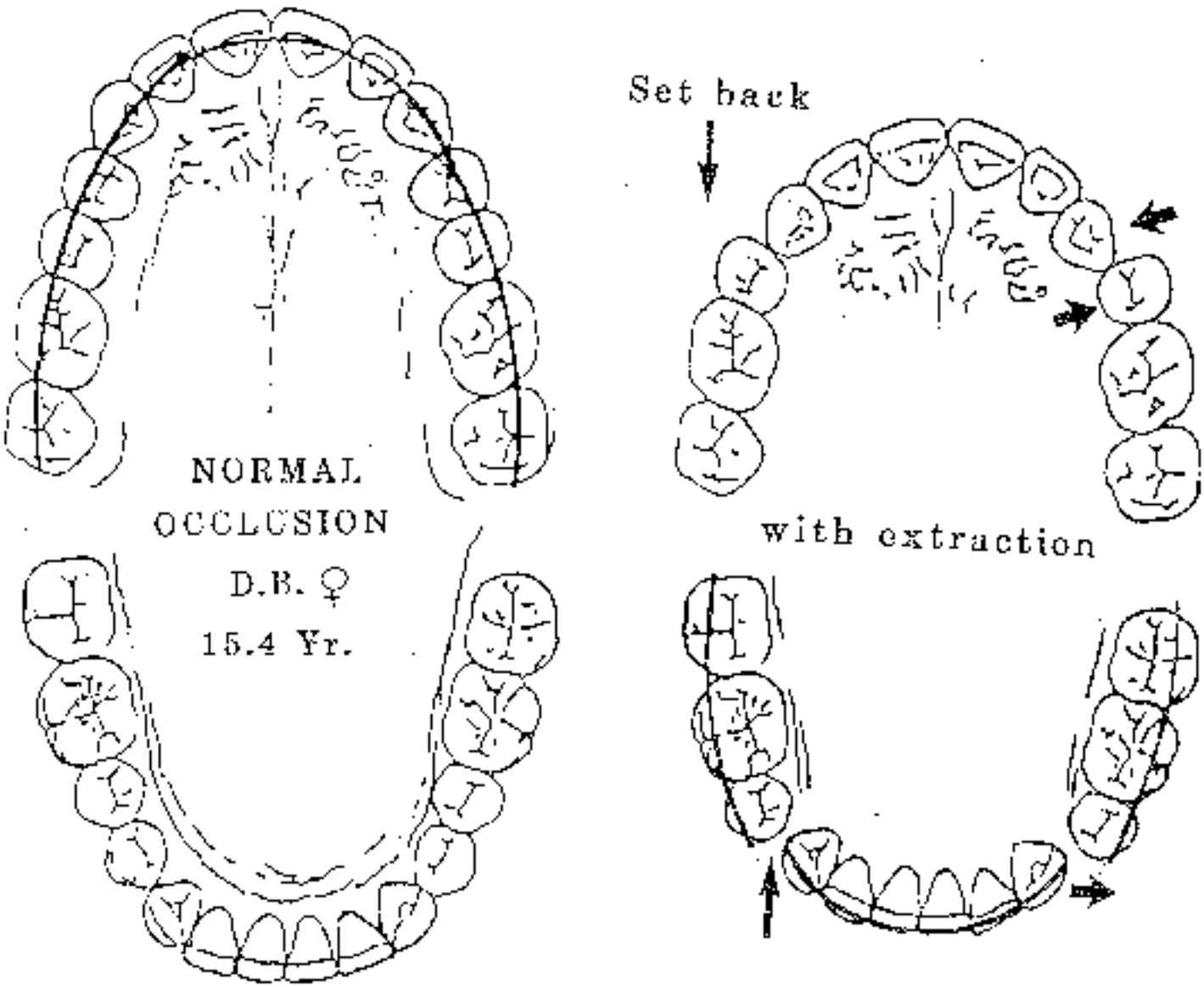
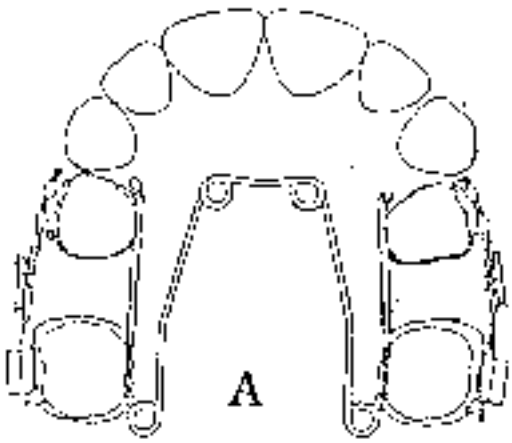
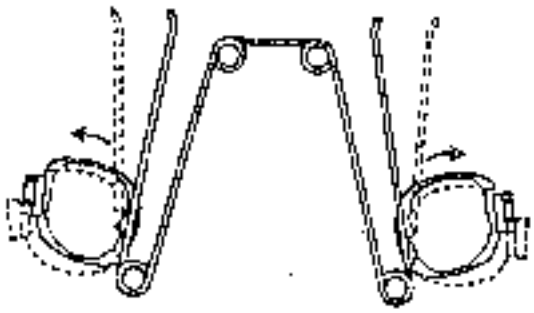
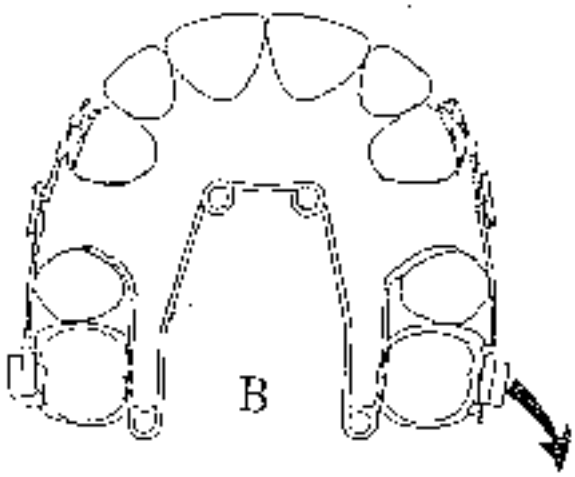


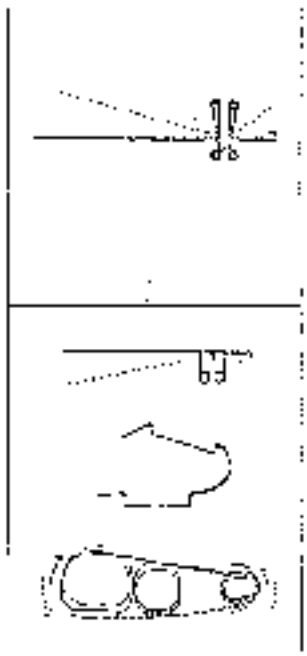
Fig. 41. From tracings of normal occlusion the first premolars were removed and the six anterior teeth in each arch were set straight backward. This showed the buccal-lingual problem of fitting. The lower pre-molars and molars must be contracted or the canines will be over-expanded and unstable.

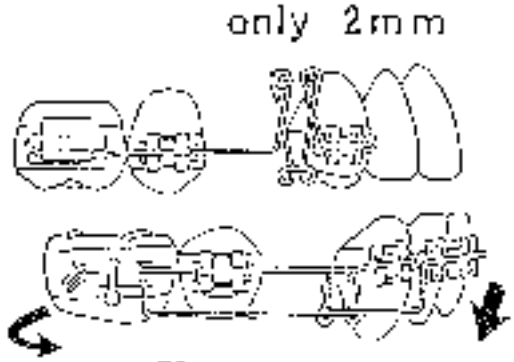






Rotate and Expand
for anchorage





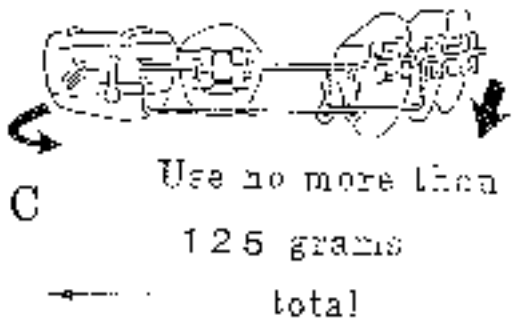


Fig. 42A. The choice in extraction therapy is to remove upper second premolars and lower first pre-molars. The activated quad helix helps anchor the molar into the key ridge as retraction of the first premolar tends to pull the canine with it.

Fig. 42B. The second premolar can be locked with the quad helix while canine retraction with a mean of 75 grams is conducted. This is followed by a straight section while anterior retraction is conducted independently.

Fig. 42C. The lower Utility Arch can help anchorage in the lower but neither retraction section should be opened more than 1.5mm for best canine movement without anchorage loss.

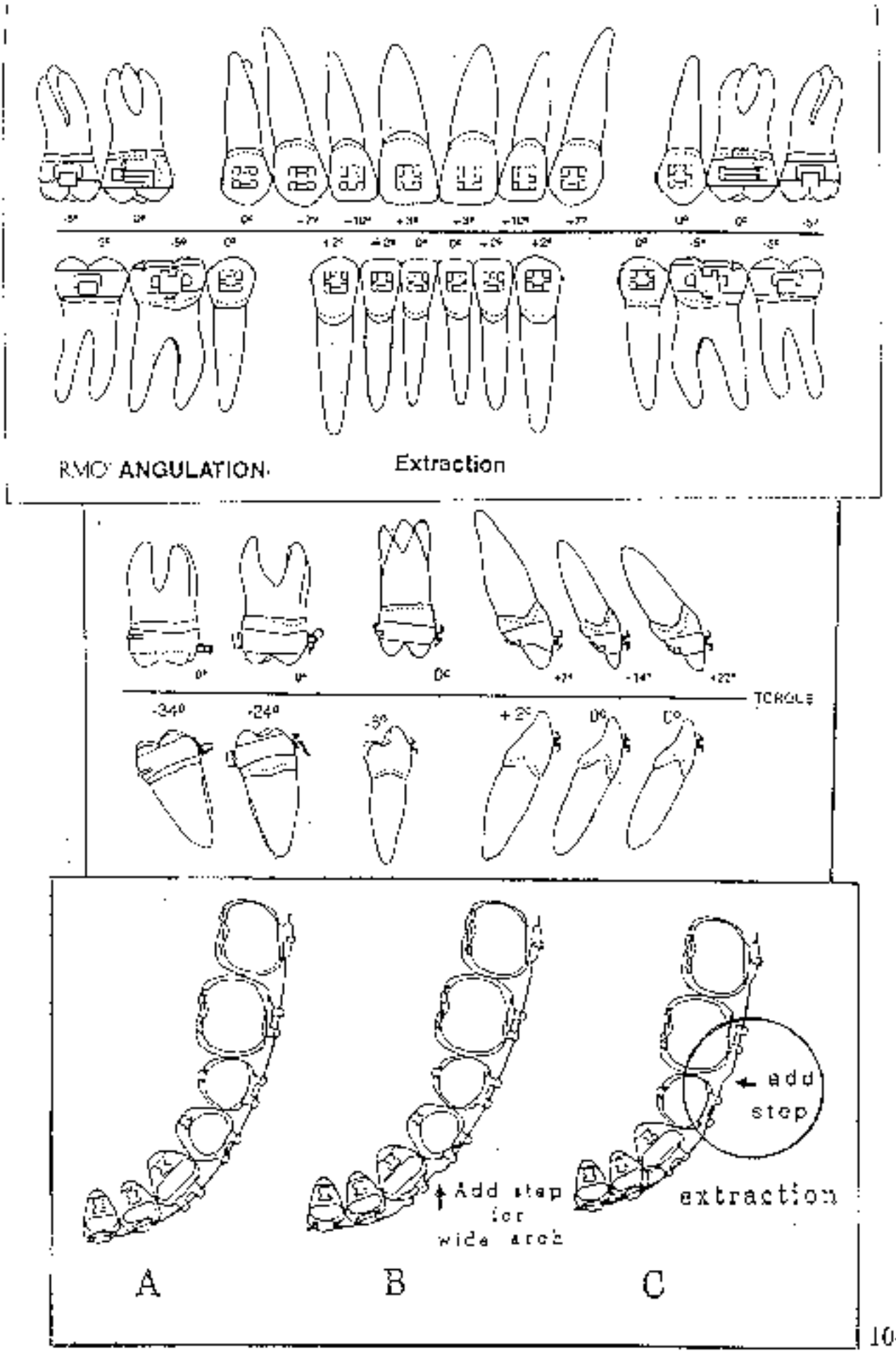


Fig. 43 The heights and angulations in extraction treatment are the same as non-extraction.

For ideal fit for the lower second premolar when the lower first is absent, the mesial-buccal line angle is reduced to simulate the first premolar tooth anatomy. The distal marginal ridge may also be reduced when necessary, toward the lingual, to receive the lingual cusp of the upper first premolar. When the upper first premolar is removed, the upper second premolar can be tipped forward slighty to permit normal distal angulation of the upper canine root.

Many extraction patients are finished with insufficient upper incisor torquing and bites that are too deep. This invites lower crowding later as shown by the Washington group in 1981.

The Ricketts Extraction Pattern Preference

In the contemporary practice, about 20% of total patients may be a candidate for extraction **for esthetic purposes**. In early treatment, by actual count, only 7% received premolar extractions. Clinicians observing anchorage loss with standard continuous wire techniques will automatically remove all four first premolars. However, ideally the removal of four first premolars presents problems. A more appropriate **combination for extraction is the upper second premolar combined with the lower first premolar**. (See Figs. 42 & 43) in other words, upper 5s and lower 4s.

There are ten reasons for the extraction of upper second premolars and lower first premolars:

1. The first deals with premolar crown mass. Frequently the upper first premolar is wider mesio-distally than the lower first premolar. The same amount of mesio-distal tooth material is not removed with routine extraction of all first premolars. However, the upper second premolar is often narrower than the mesio-distal width of the upper first premolar and matches more closely the width of the lower first premolar.

2. Following the extraction of the upper first premolar, it is difficult to align the root of the second premolar with the root of the canine. But in first premolar extraction cases, the second premolar must either be inclined forward or the upper canine root cannot be placed in its normal distal position relative to the crown.
3. The upper first premolar with its double root, **is better designed to take lateral stresses** at that important site in the arch.
6. The canine distal contact with the second premolar in the upper is also difficult because of the occlusalward mesial marginal ridge anatomy of the second premolar. The first premolar has a broken mesial marginal ridge.
7. After extraction of premolars, the Quad Helix is placed and rotations are attended to from the beginning. The **retraction section** with 100 grams of force applied to the upper first premolar will be followed by a surprisingly generous amount of distal retraction of the upper canine also. Hence, the anchorage factor is not nearly so extensive as might be assumed.
6. In the lower, if the second premolar is removed, the first premolar makes a poor contact with the first molar.
7. When four first premolars are removed and en-masse retraction of the anteriors is attempted, **the bite tends to close**. It cannot be easily leveled with straight wire again until space closure is completed. When the lower first and the upper second premolars are removed during the treatment therapy, the lower second premolar can **be opposed by the upper first premolar during the major stages of the correction.**
7. Particularly in adults, space opening distal to the upper canine is a major problem during retention. One reason for this is that **space closure cannot be over-treated.**
9. In older patients with caries problems, very often both the mesial and the distal of the upper second premolar will have received restorations. The second premolar may have an unsightly filling.

10. At the time of completion of the occlusion, the mesial line angle of the lower second premolar can be re-contoured to simulate the anatomy of the lower first premolar.

While all these reasons may be subtle, when put together they can be effective in the consummate occlusion, finish and permanency desired.

39. Lip Surgery

Many orthodontists and dentists recognize the tight lower lip as an obstacle to the forward movement of the lower arch or increasing arch length by advancing the incisors. History has shown that heavy force against a tight lip will endanger the gingiva and end up with stripping of the lower incisor soft tissues and induce relapse.

We started with physiotherapeutic measures in the attempt for a relief of the lower lip sub-labial tissues. In the 70s, a surgical procedure was worked out for patients with the *quadratus inferioris* union, which is present in 25% of the Caucasian population. The mid-symphysial raphe in the lip is removed, and the muscle in the sub-labial area is sectioned. **(Fig. 44)**

Dr. Sidney Fredricks also proposed a sectioning of the buccinator at the molar area, and Dr. F Caligiuri isolated a distinct muscle band independent of the buccinator to extend from one spheno-mandibular raphe to the other. This contains the lower arch. This we called the *musculus tranversarius* because of its continuous strap.

In the upper lip, a lowering of the muscles around the lower margin of the periform aperture has been effective in lengthening the upper lip to circumvent the need for some of the LeForte impactions.

40. Advancing-Reduction Genioplasty

Chin modification through surgery can effectively save the patient from a full mandibular operation or LeForte surgery. Adult Bioprogressive orthodontics with sectional mechanics, plus a chin advancement is a safe and rapid procedure in the hands of a good surgeon. It is also much less risky. The removal of a

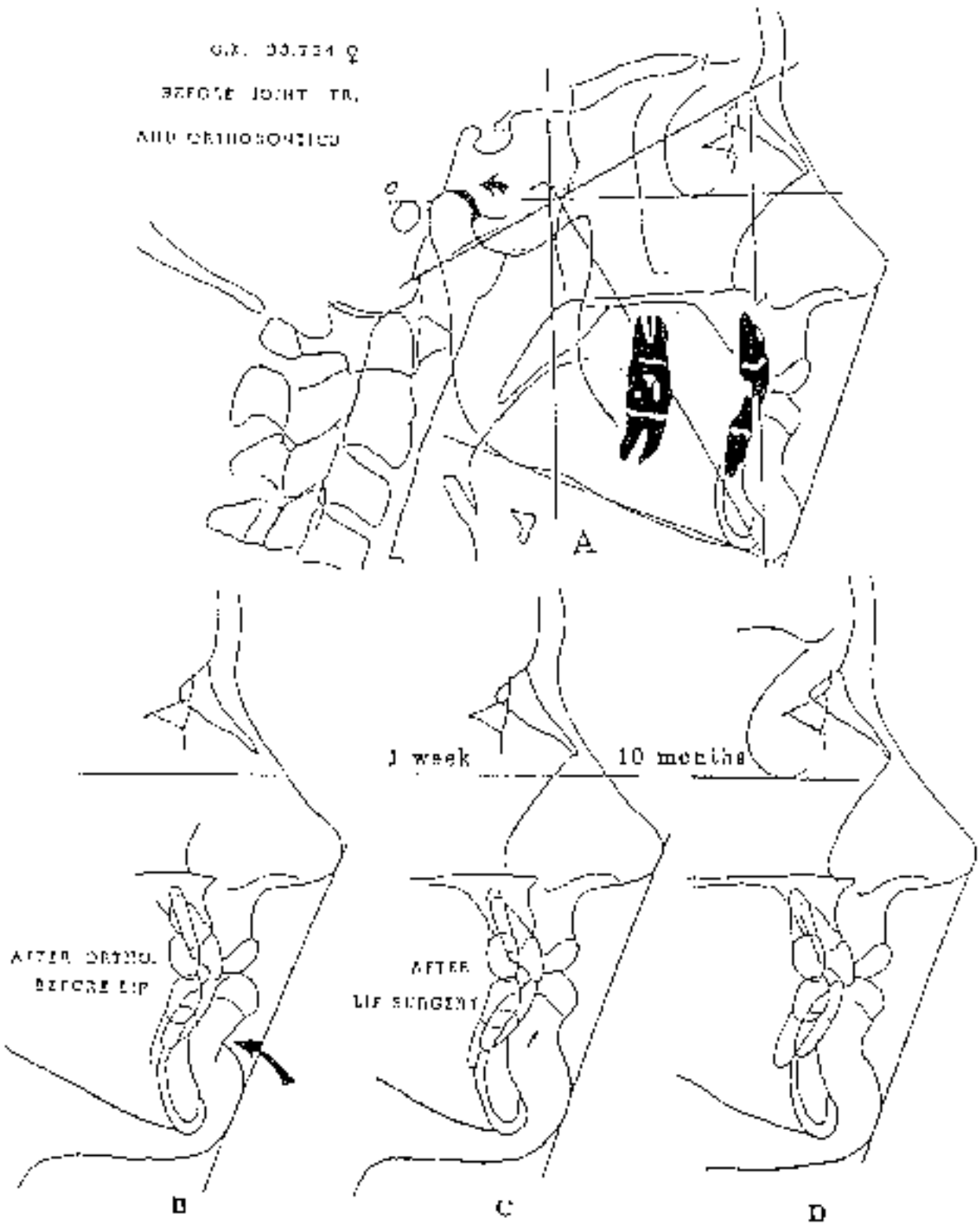


Fig. 44. In order to avoid flat mouths a surgical release of the lower lip is successful. This is an alternative to lip myofunctional therapy and to extraction. Lower arch length was corrected for 12 mm of shortage in this adult female

section of bone and the elevation and advancement of the distal-fragment cannot only be quite dramatic in facial esthetics, but it will also permit the patient to close the lips without strain. **(Fig 45)**

Care should be exercised in maintaining periosteal attachment and blood supply to the fragment. Denudement will often be followed by resorption of the bone. Studies have shown a remodeling to be 25% of the advancement. It is well to generously advance the fragment about that amount.

41. Distraction Osteogenesis

When artificial fractures are performed in the cortex of bone and the first stage of bone healing has been initiated, then the bone can be stretched with new bone formation taking place. These procedures can be employed at the symphysis to widen the chin or can be used to lengthen the mandible at the ramus-body angle.

In addition, the maxillary complex, including the zygoma, can be modified, particularly in many of the cranio-facial syndromes.

The clinician should, however, look to these procedures as a last resort making certain other alternatives have been considered. The interesting factor is the stability rendered. This means a modification of the periosteum and the stretching of muscles which means a comparatively rapid formation of new sarcomeres.

42. Semi-Plastic Appliances

From the 1950s on through the 80s, experiments with progressive positioners were conducted. We even employed extra-oral traction on positioners to help retract incisors as Kingsley had done in 1850. But most practitioners gave up eventually and used various materials for final positioning after active treatment.

With the successes of mandibular posturing in some patients, there is a feasibility of this approach. It is difficult to accept the idea that a modification of basal bone can be achieved with this approach..

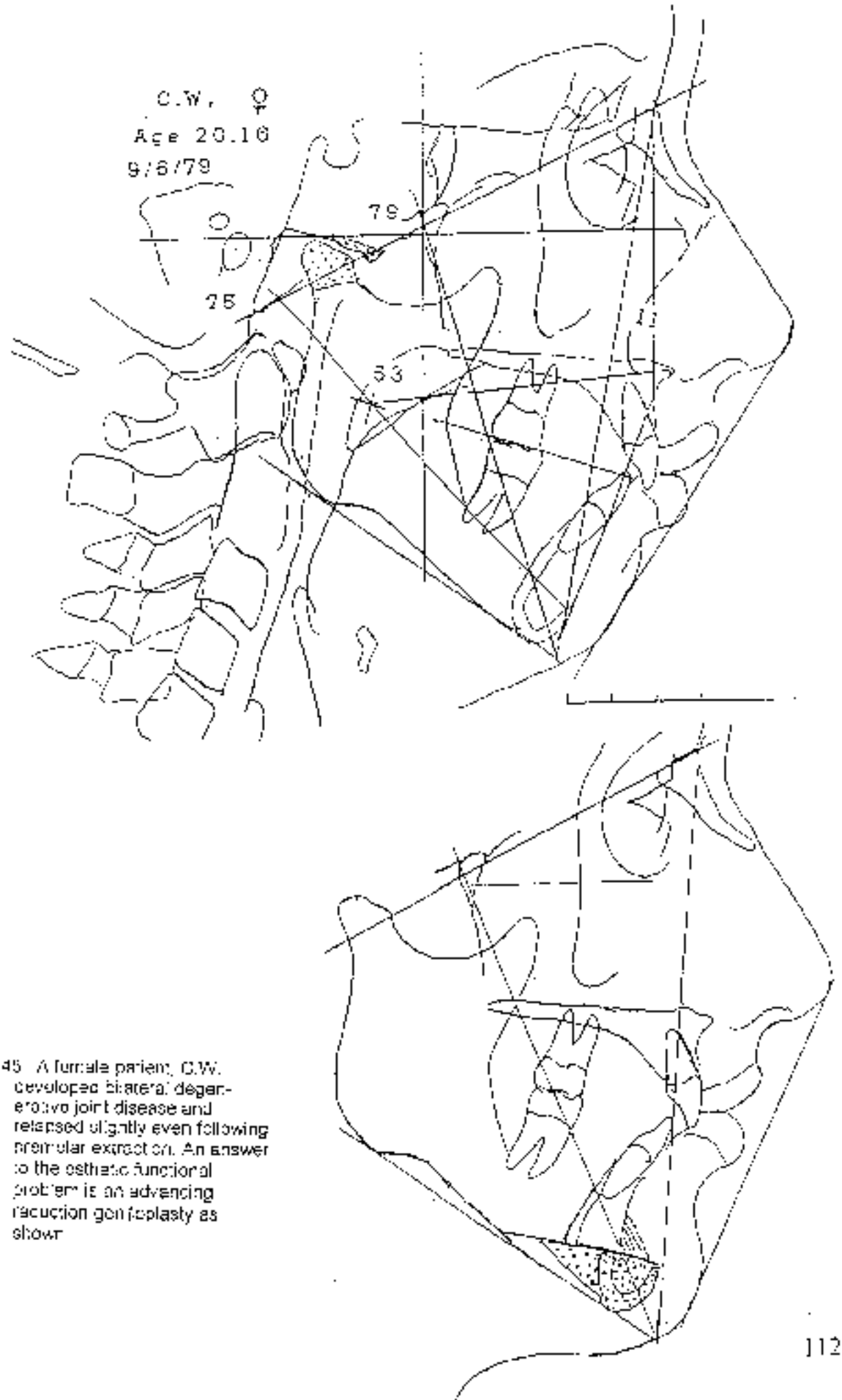


Fig. 45 A female patient, C.W., developed bilateral degenerative joint disease and relapsed slightly even following premolar extraction. An answer to the esthetic functional problem is an advancing reduction genioplasty as shown

When it is combined with inter-proximal reduction of tooth mass, the plastic approach may be an alternative in some moderate conditions in the adult malocclusion.

The key for success is cooperation and compliance. It is ironic that such a movement would emerge in the profession at the same time that the orthodontist sought procedures where non-compliance was an issue. Time will tell. For certain, it is not cheaper because the construction is so labor intensive. At best it will fill a niche, but it will be a bait for the innocent general practitioner. Angle called it "tinkering'.

43. Soft Tissue Behavior

Clinicians become quite confused when trying to imagine the soft tissue profile behavior as a result of treatment. Esthetics is the main goal and soft tissue changes occur gradually. The prospective rendering on paper with the VTO is therefore a marked step toward clinical sophistication.

Data on the growth of the nose, lips and chin was collected in order to derive the first VTO in 1950. Ironically, the values derived have changed very little to the present day.

The first step in making the determination is to know the normal growth behavior and mean expectancy. By learning six sites for a starting reference, a procedure can be made orderly. **(Fig. 46)**

1. The nose depth is related to the anterior nasal spine. That being the "root base" a change in the hard palate and height and depth of the anterior nasal spine becomes a key. From that point the nose grows forward at almost exactly 1.0 mm per year and the variation is strikingly low in all races after age 6 years.
2. The second area is the sub-nasal area also evaluated from the curve of the nasal spine base in an oblique direction downward and forward. It usually increases at 0.35 mm per year or one mm each three years.

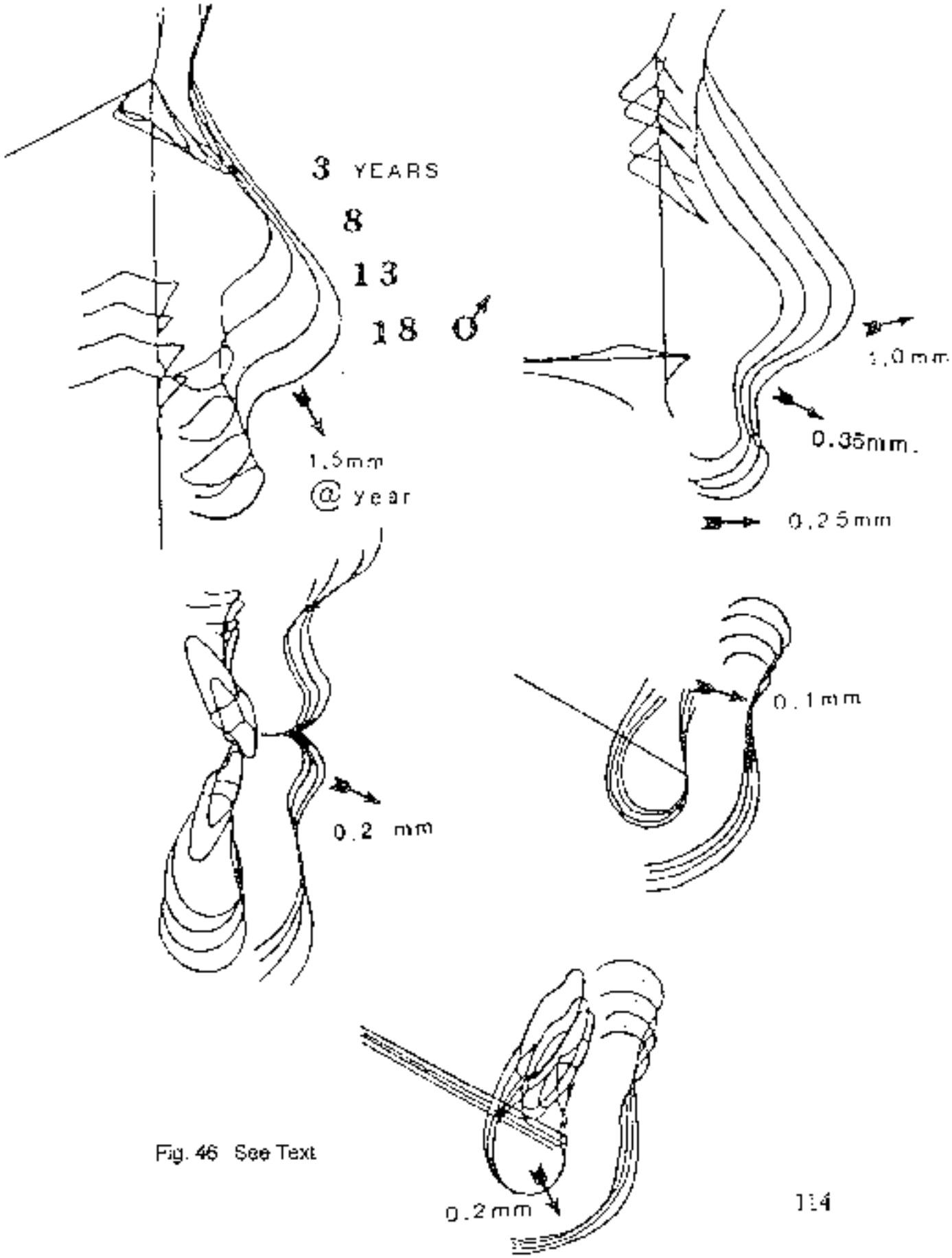


Fig. 46 See Text

3. The upper lip is measured from the labial of the crown of the upper incisor. The upper lip thickness will increase with retraction of the incisor but in long term an adaptation and growth will average about 0.2 mm per year increase.
4. The lower lip takes its thickness downward and forward from the upper incisor. When Division 1 conditions exist, its thickness is measured from an inter-incisal bisection point. It will likewise increase at a rate of 0.2 mm per year. In both lips the thick lip types may increase 0.25 mm per year. Forecasting is difficult when the initial x-ray is taken in repose.
5. Sub-labial thickness increase is very little at 0.1 mm per year. In effect, if the B point is moved, the sub-labial tissue will follow in either direction, forward or backward.
6. Chin strain is perhaps the most difficult to assess. Mentalis elevation can increase with protrusion and also with lower face height increases. It also normally thickens at a rate of 0.2 mm per year. In males, the symphysis increases at 0.2 plus as much as 0.3 mm of soft tissue increase may be seen. Prediction of the chin therefore is responsive to the treatment.

44. Principles of Correction

An old expression in teaching orthodontics is that there is no cookbook. Each patient is a separate entity. Yet the dilemma exists because students and clinicians request lessons on technique repeatedly. There is indeed no shortage of ostentatious and glittering practitioners eager to sell themselves or sell their wares.

However, general practitioners have for a century accused orthodontists of harboring secrets. The truth is there are dozens of orthodontic journals and texts

on a worldwide basis and therefore there **are no secrets**. Orthodontics is a comprehensive subject if it is to be known adequately.

A logical order forms a basis for practice. Once the description of the conditions surrounding the malocclusion is determined then growth is forecasted. The third step is to establish objectives. This was set forth in Part I. It is emphasized that objectives in turn are dependent on the clinician's knowledge of possibility with the modality chosen for the individual patient. Possibility starts with the information on the achievements demonstrated. Belief in possibility yields confidence when results are repeatable. It therefore is evident that a clinician must apply appropriate principles.

A principle is a general truth. It is usually trustworthy. However, it is not without exception. The good clinician is guided by principles not dictated by techniques interpreted as laws to be applied as recipes.

If there is anything to be learned from clinical research, it is that several principles are involved for the treatment of deep bite. When Dr. Albert Ketchum, in the 1920s, recalled hundreds of patients years after treatment termination, the results were shockingly miserable. Deep bites had relapsed 100% in far too many patients. His apparent theory had been to treat deep bite conditions as if it were due to mandibular "over-closure." He had, as many before and since, extruded the posterior teeth, thinking that it was impossible to intrude anterior teeth. Perhaps the mandible had been "over-opened" in the treatment process and may have closed again over time.

Dr. Clifford Ballard of England, as late as 1970, was completely negative toward the ability to align lower incisors successfully. Why is it then that Bioprogressive users consider the fear of relapse of deep bite to be essentially a non-entity? The Utility Arch employed correctly with the proper wire has been a "Godsend".

The first principle in the treatment of deep bite, and all treatment for that matter, is to intrude lower incisors when indicated and to keep them out of functional interference.

The second principle is to adequately torque the upper incisors. We use 22° brackets on the upper central incisor and 14° on the upper lateral incisor and 0° torque on the lower incisors.

The third principle is over-treatment of the over-jet giving functional meta-positioning a chance to operate.

The fourth principle is to prevent the auto-rotation of the mandible beyond one or at most two degrees. If the patient is Class III, the opposite applies. Five and six degree openings may compress the condyle and inhibit growth!

Other principles are involved in Class II correction. Unless the mandible is propped open and the condyle is compressed to a damaged state, many studies have shown that the mandible will seek the size and position that it would have taken without treatment. Research has proven this fact beyond question.

The maxilla, however, is a different story. Science has proven that the mid-face can be permanently altered. That being the reality, the treatment for skeletal problems resides mostly in **the influences on the maxillary complex**.

Despite the dilemma there are some starting plans and principles that can be employed. These are particularly challenging in Class II conditions. These involve maxillary orthopedics, maxillary orthodontics, mandibular orthodontics and temporary activation. **(Fig. 47 & Fig. 48)**

45. Consummate Occlusion

Mediocrity has no place in orthodontics. The final cause of fixed appliances is toward perfection! One of the most incredulous situations in all of dentistry is that throughout its history there is no agreement concerning the most perfected fit of teeth to strive for on a clinical basis. The number of formulas bears witness to this fact.

In Orthodontics there is a further condition. It is to place teeth in **positions of resistance to the forces that produced the original malocclusion!** With this in mind, the author spent a career in seeking the most consummate arrangement to encompass all the factors clinically involved. **(Fig. 49)** Other factors dealt with

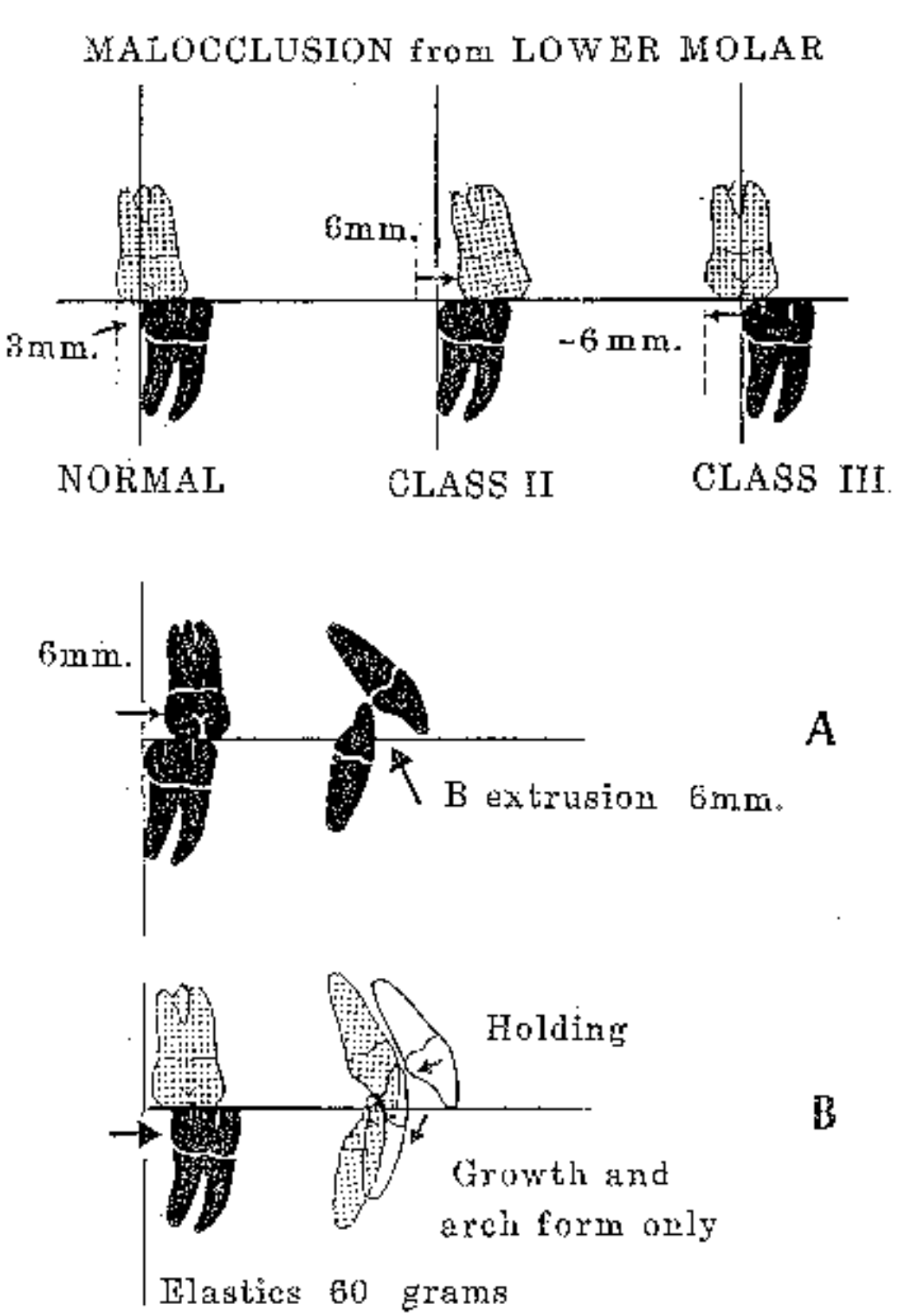


Fig. 47

A typical Class II has a +6 mm. molar fault. Class III is present at −6 mm.

A. The deep bite Class II also has 6 mm. extrusion of lower incisor.

B. By holding the upper with elastics, intruding the lower incisor, and not rotating the mandible, a correction can be made with excellent growth alone.

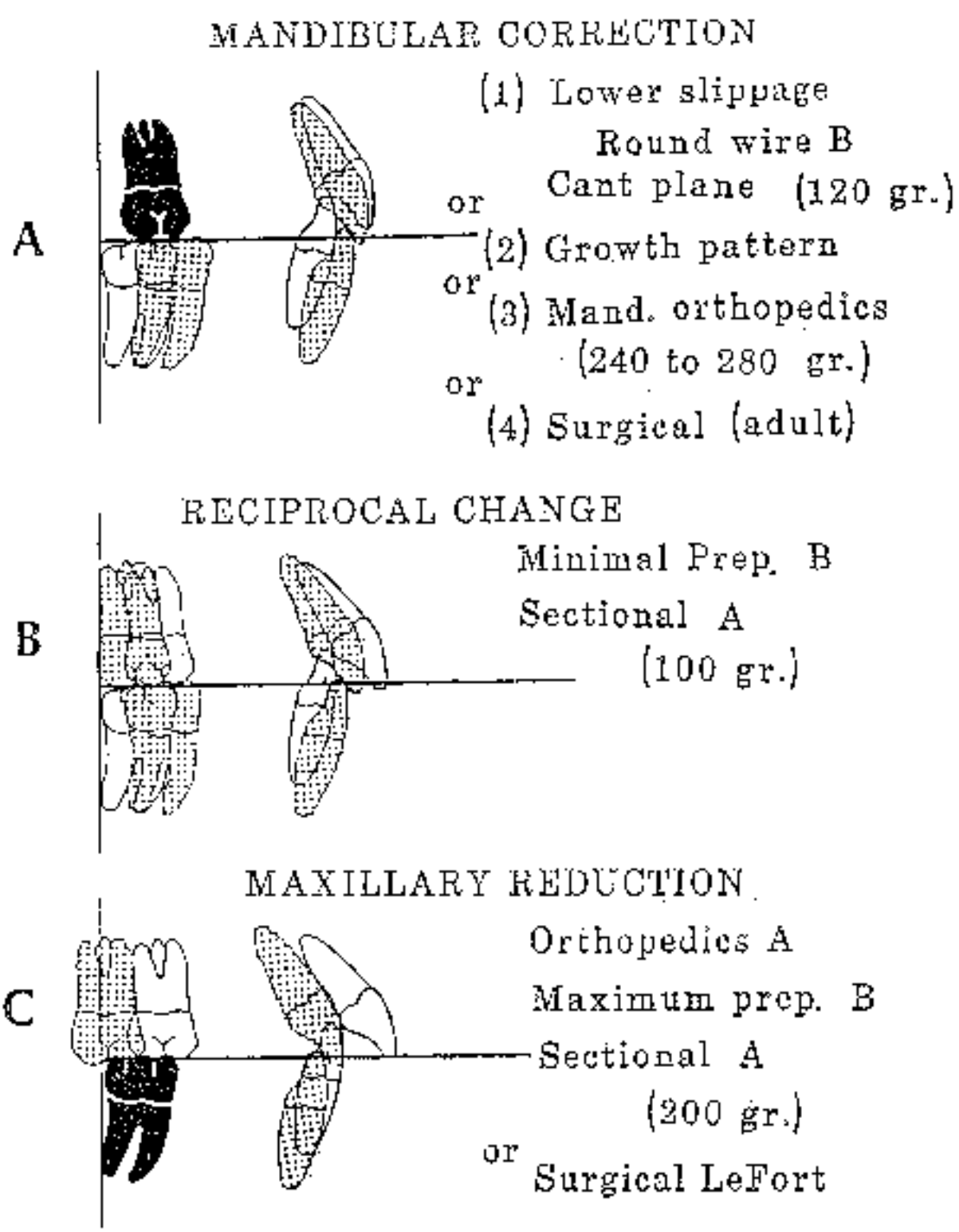


Fig. 45 Hierarchy of correction.
A. Forward movement of lower arch and no upper molar change by one of four methods.
B. Movement of both arches reciprocally.
C. Essentially full reduction of maxilla.

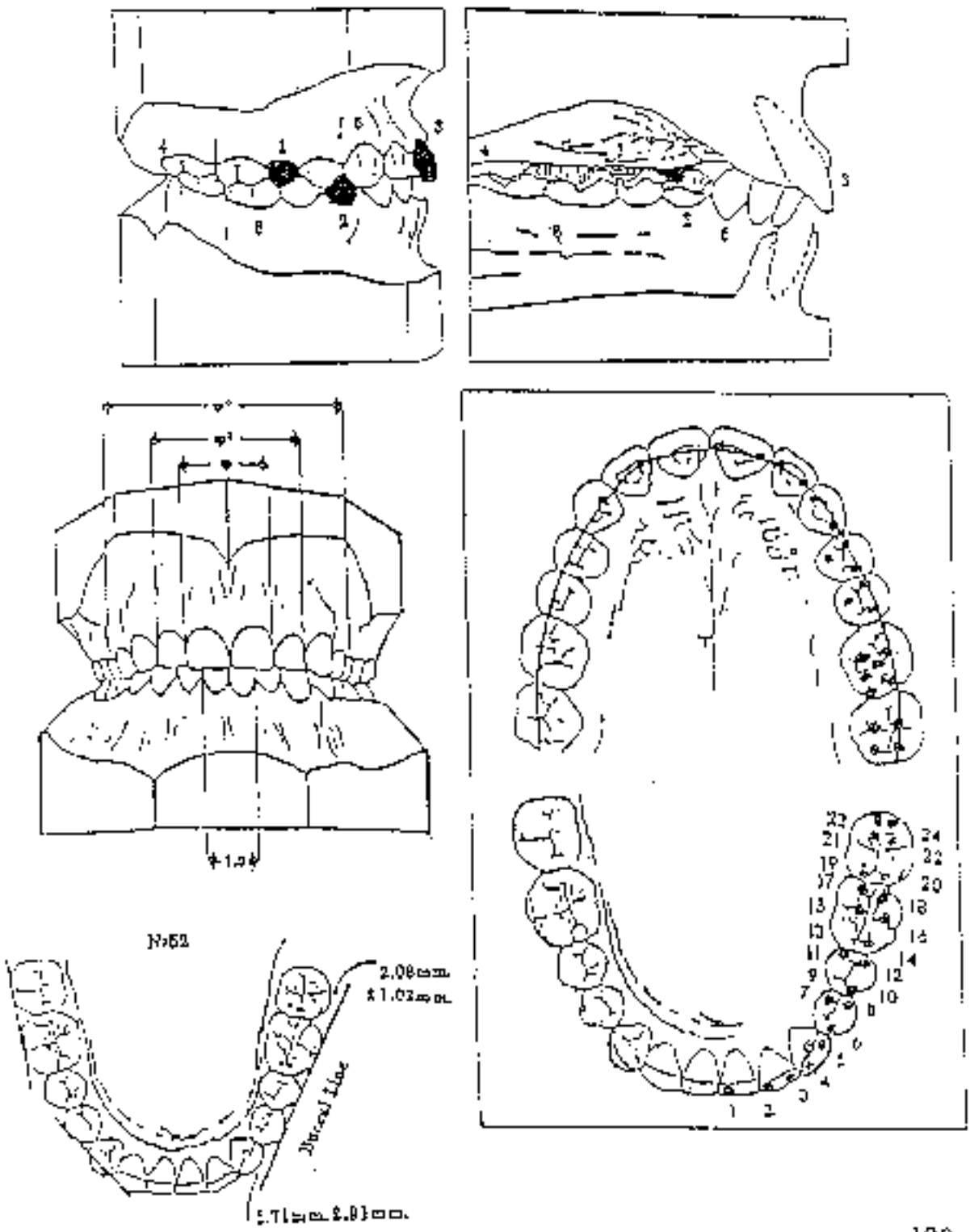


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Fig. 49 See Text

anchorage and cortical avoidance. The result was an arrangement called the "Therapeutic Ideal".

The Facile Formula was designed to bring this about as much as possible. The first requirement in clinical occlusion is to know the key sites for check points and objectives. The molars are the foundation! But the key to the molar occlusion is the upper second premolar fit (at contact #14).

The second key site is bucco-lingually at the lower first pre-molar. This is the key to the canine (at contact #16).

The third key is the inter-incisal angle relation. Most clinicians under-torque the upper incisors.

Arch form, Curve of Spee and denture emplacement are other factors.

In order to make occlusal relations a science, the contact stops were numbered. These are registered in the marking tapes occlusally.

The arch dimensions were displayed and arch forms were shown earlier. It is clear that orthodontists throughout history have mismanaged second permanent molars. Special attention to tube design was found necessary.

There is little reason not to produce ideal relations routinely. It means setting up properly and then performing.

Summary

The words of Robert Henri, one of the five great American artists, comes to mind in speaking of movements. He said:

> "There is the new movement, there always has been the new movement, and there always will be the new movement. It is strange that a thing that occurs like clockwork should always come as such a surprise. In the new movement, masters make their mistakes and innocent apes follow. It is necessary to pierce to the core the value of a new movement rather than being swayed by the sensation of its exterior"

- Every movement, every evidence of search is worthy of the consideration of the student.
- The student must look things squarely in the face, know them for what they are worth to him.
- Join no creed, but respect all for the truth that is in them.
- The battle of human evolution is going on.
- There must be investigations in all directions.
- Do not be afraid of new prophets or prophets that may be false.
- Go in and find out. The future is in your hands.

For this dissertation, a broad scanning of the sciences and the clinical aspects were considered. Professional attitudes were examined.

Most professionals fall into complacency, because a forced change causes stress, which people try to avoid. New movements can, however, be exciting to some who have an adventurous spirit. New movements may break up the drab routine that a professional can become locked into.

Many new developments have taken place in Physics and in Technology. These were discussed in five categories with reference to application to orthodontic interests.

There is a new biology. With the discovery of DNA, the nucleus of the cell was erroneously considered its brain; the nucleus is actually the gonad. Electron microscopy has opened up a greater understanding of the cell membrane with protein and sugar molecules at its surface that interplay discretely with the immediate environment--the interstitial fluid. Hence, the membrane is its brain. A contact is also made from cell to cell. Eight separate subjects in biology were discussed. Because we practice with biologic principles, these aspects become important issues to meld with clinical science.

Twelve topics were reviewed under the general heading of movements in the clinical aspects. Thirty years ago, I raised the ire of several educators in an audience when I made the statement, "Schools do not teach cephalometrics." One professor was quite distraught insisting that they taught seven different analyses. "That was just the point," I replied. "You may present a lot of numbers but the issue is what the student is to do with them."

How many schools insist on a VTO for each patient? Literally all still reject the whole idea of a VTG to maturity? How many teach growth and then advise waiting until growth is nearly over before starting treatment? How many employ frontal head films for analysis, monitoring or planning? How many routinely employ joint tomographs?

These procedures pertain to diagnostics or the complete determination-resolution process (DRP). They also relate to methods of serial analysis, a perspective of growth of the mandible, on a curve, and the important aspects of condyle behavior.

The idea of early treatment just will not go away. This is despite the efforts of many theoreticians in education. Also, the clinician faces the problems of the tempero-mandibular joint which denial will not solve. Thus, there were twelve clinical categories that loomed important enough for discussion.

The last group of subjects was placed under the heading of mechanics. Fourteen categories also were covered in this group. Starting with appliance designs more than fifty years ago, research has led to a "Facile Formula" for the most practical use of tube and bracket innovation. There were factors in anchorage that needed to be considered when the orthodontist chooses to extract premolars mostly, in the end, for satisfaction of esthetic requirements.

In contrast, to the idea of complete simultaneous "control" procedures, the idea of staging has proven to be of great merit. Priorities are selected and step by step progression toward the goal is a sensible course.

It is indeed amazing what can be accomplished with two upper molar bands when used for the Quad Helix or for cervical extra-oral extraction or face mask. If the root ratings are not known and applied, the orthodontist is lacking a most noteworthy tool.

Surgical procedures are well known, but the application of the genioplasty alone is under-appreciated. Distraction-osteogenics is a remarkable tool and will find its rightful place.

Plastic appliances may have an application, but, sooner or later, many clinicians learn to go ahead and place an appliance and get on with corrections rather than procrastinating or becoming frustrated or settling for inferior work.

As an aid to colleagues struggling with soft tissue behavior, the growth of the nose, lips and chin was described. Clinical experience and close study of before and after lip behavior will help with soft tissue forecasting.

While standard treatment modalities are described, the clinician usually does best by following basic principles. Some of these were covered particularly with problematic deep bite.

Waiting until last, the keys to the "Therapuetic Ideal" occlusion were described together with contact stops as a process toward perfection.

ORTHODONTIA

By Edward H. Angle, D.D.S., St Louis, Missouri

According to our literature it is now 351 years since we began the practice of orthodontia. Its history reads like a romance and is exceedingly interesting, showing, as it does, the various evolutionary stages through which it has passed and the wonderful unfoldings which have taken place in every phase of the subject. Its history is similar to that of most sciences in that ignorance and crudity of thought has been gradually eliminated and supplanted by knowledge of the truth and correct principles, until today, we can with truth say, the science of orthodontia has attained a high degree of perfection. The subject has been broadly studied, the etiology has been ably investigated and the state to which the regulating appliances have been brought is probably very nearly perfect, so that, with our present knowledge of the science, it is possible by beginning at the proper age, to bring about most wonderful results, even in patients afflicted with the most noticeable deformities.

Cramped and narrowed arches are now easily enlarged and made to assume that graceful form in harmony with the peculiar facial type of the individual; twisted, inlocked and outlocked teeth are made to quickly yield to the intelligent application of force and to assume positions of usefulness in the lines of beauty. In those marked deformities of orthognathism and prognathism the teeth may be adjusted, and the maxilla moved backward or forward until lines of facial harmony have been established, and, at last, and more important than all, the teeth may be brought in harmony with that great law which is the basis of all dentistry, namely, correct occlusion. Without this, no artificial denture, filling or corrected case of irregularities was ever yet a real success, for the establishment of perfect occlusion means the establishment of harmony throughout. Printed from *The Dental Review*, March 1896

This statement in 2002, one hundred and six years later, sounds haunting, does it not?

Beloved students and colleagues, fulfill your obligations to your time. The pursuit of knowledge is endless. There is no place for ignorance in a professional endeavor. Confusion breeds frustration and stress. Therefore, be an eternal student. Do not let disorder and depression occupy your life.

Profound knowledge has many virtues. Organization and order puts it into perspective. The application of knowledge results in confidence and security, which drives purpose. Boldness and success are twin brothers. Achievements are the foundations for happiness.

New dimensions are always available, so stretch the mind! Every human has the capacity for etheric discharge!

Robert Murray Ricketts

Scottsdale, Arizona, 2002

STRETCHING THE MIND TO NEW DIMENSIONS

Robert M. Ricketts D.D.S., M.S., N.M.D.

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