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RESEARCH ARTICLE

CHANGING CONCEPTS OF BEAUTY IN ORTHODONTICS

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Abstract

Over the years we have become more educated and conscious, with that there is a continuous transitions of concepts regarding esthetics and shift in the mindset and the standard of beauty by the common people and orthodontist. The invention of newer technologies, methods and upsurge in the amount of research performed worldwide has resulted in both technological and conceptual changes in every era. This transition is dynamic in nature and will be superior with continued efforts.

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Introduction:-

Evolution Of Beauty:-

The importance of Facial esthetics had always been in our minds subconsciously since the prehistoric times. About 35000 years ago, the Paleolithic man, during this period found the leisure and time to develop and appreciate the facial beauty.

This esthetic sensitivity was preserved in primitive art and paintings depicting hunting themes, figurines and representations e.g. "Venus of BalziRossi" which were discovered recently¹ The Idealized Egyptian of the old kingdom exhibited a round, broad face with a sloped forehead, weak brow ridge, prominent eyes, evenly contoured nose, thickened lips and a mild positive chin². Many centuries later, prominent Greek thinkers such as **Plato** and **Aristotle**, with their classical sculptures of **Venus de Milo** and **Apollo Belvedere**, shared their principles of interior beauty and philosophy of art. The facial proportions carved in these classical Greek sculptures have greatly inspired the work of many early orthodontists such as **Angle, Case and Lischer**².

With the Rapid development of printing in the Renaissance Period in European history between the 14th and 17th century, writings and literature on beauty and esthetics began to appear³.

In the Early 16th Century, an Italian named **Agnolo Firenzuola**⁴ wrote a book describing the Beauty of a woman and during the 17th, 18th and 19th centuries facial esthetics was studied extensively and documented. One of the first objective study was done by a British named 'Woolnoth' in 1865 who classified the facial profile into **straight, convex and concave**⁵.

In the later part of the 18th century, **Camper**⁶, a Dutch anatomist proposed a new means of comparing the profiles of mammals, which was one of the first important contribution to the study of facial profile. A few years later, **Retzius**, a Swedish anatomist classified the races of man into orthognathic, the straight-jawed, and prognathic, the prominent jawed.

The Anthropologists and Anatomists soon realized to standardize these reference planes in order to compare craniometric and cephalometric findings. Hence at the International Congress of Anthropology, 1884, held in

Frankfort, the horizontal line introduced by Von Ihering in 1872, was selected. This plane was popularized as the **Frankfort Horizontal Plane**. The next important contribution was that of **Dreyfus (1922)**, a group of European investigators who drew a vertical plane through Frankfort horizontal plane for measuring profile change

The Angle Era:-

Angle, The Father Of Modern Orthodontics, has stated that **beauty, balance, and harmony** are the important points to be considered in facial profiles. The profile of the statue of Apollo Belvedere was described by **Edward H. Angle** in the **Sixth edition of his textbook**, published in 1900 as "a face so perfect in outline that has become the model for students of facial art." **Angle in 1907**, in his **Seventh Edition of Malocclusion of the teeth** stated his opinion that "the study of orthodontia is indissolubly connected with art as related to the human face" "Angle reached this conclusion "that there is a law for determining the best balance of features "and "it is that the best balance, the best harmony, the best proportions of the mouth in its relation to other features require that there shall be the full complement of the teeth and that each tooth shall be made to occupy its normal position⁸. Angle believed that a "full complement of teeth" was needed to create an esthetic or "harmonious" face. This philosophy of his influenced orthodontics for a long time. However Angle's ideas about appearance and his aversion to tooth extraction did not go over well with everyone⁸.

Around this time, **Simon⁹** oriented the face in three planes of space-the orbital, the median sagittal, and the Frankfort horizontal planes whereas Edward H. Angle insisted that it is the dentition which indicates the need for orthodontic treatment. **Calvin Case (1921)¹⁰** was one of the first to concern oneself with the analysis of soft tissue profile. In his opinion, balanced profile should be one of the key factors for deciding on the method of treatment for any form of malocclusion

Advent of Cephalometric Era:-

With the development of cephalometry in orthodontics it encouraged the researchers to study the facial growth and development in different facial forms and esthetics. **Carrea¹¹** was the first to use radiography to study facial features, adapting soft lead wire to the facial profile and taking radiographs to study facial prognathism. **Brodie and colleagues¹²** in 1938 used cephalometrics as a research method to evaluate treated patients whereas **Highley and Speidel¹³** described a technique of outlining the soft tissue profile on the lateral cephalograms. **Tweed¹⁴** defined normal as "that balance and harmony of proportion, considered by majority of us as most pleasing in the human face". **Downs¹⁵** recorded a definite facial pattern for individuals with excellent occlusion in 1948, and found significant differences on both sides of the mean facial pattern, saying that these are the variations that must be taken into account when assessing the balance and harmony of the face. He also established a set of dental and skeletal parameters that defined an average face with excellent occlusions. Later this set of parameters was modified by other researchers like **Steiner¹⁶** who took inspiration from **Downs and Reidels¹⁷**. **Ricketts¹⁸** used an esthetic plane, a line tangent to the tip of the nose and a soft tissue pogonion, suggesting that in adult females the lower lip was best positioned 2mm back to the line.

However with the increasing developments in cephalometry, it changed the focus of soft tissue facial profile to dental and skeletal structures. The emphasis was more on achieving the perfect dental and skeletal structures to normal mean values rather than focusing on the facial profile and esthetics of the patient. The majority of orthodontists like **Angle** made the mistaken belief that if dental and skeletal systems were balanced, facial lines would follow suit

With the change in ideologies, soft tissue parameters were introduced like Ricketts' esthetic plane, Steiner's S-line, Burrstone's subnasale to pogonion plane, and Merrifield's profile line and Z-angle which were used to evaluate lip position in relation to the nose and chin.

Burstone¹⁹ in 1958 found that the lower face not only plays a part in digestion, speech and respiration but also influences to a large extent the social acceptance and psychological well-being of the individual. Since soft tissue thickness and postural tone differ from person to person, it is important to analyze the integumental contour of the face when considering facial beauty and harmony.

The Era of Non Extraction:-

"The extraction debates of 1911"²⁰ highlighted the growing controversies against the extraction philosophy in orthodontics. Calvin case highly criticized 'The Angle School's creationist views, with their ignorance of heredity

cited as a source of malocclusion. Despite the fact that Case's claim was much superior, Angle's supporters won the day, and tooth extraction for orthodontic purposes eventually vanished from the American orthodontic scene between World Wars I and II. This continued until the 1935 when Tweed discussed about the dissatisfaction with the cases he had treated with Non Extraction philosophy. He noted relapse on incisor alignment and the worsening of facial esthetics in most of his patients. He discovered that ideal facial esthetics needed the mandibular incisor to be at 90 degrees to the mandibular plane and, later, at 65 degrees to the Frankfort incisor angle.

Techniques to obtain arch length and treat without extractions were becoming common as a way to preserve lip fullness. Extraction of premolars was being replaced by the expansion appliance (**Haas, 1965**)²¹, lip bumper (**Cetlin and Ten Hoeve, 1983**)²², lingual arch (**Dugoni et al, 1995**)²³, Schwarz plate (**McNamara and Brudon, 1993**)²⁴, and various molar distalization appliances.

In an attempt to correct profiles it was noticed that Class II malocclusion mostly had mandibular retrusion and in order to correct it Functional appliances were introduced in the market The activator (**Andresen and Haupl, 1936**)²⁵, bionator (**Balters, 1952**)²⁶, Frankel (1962)²⁷, and Twin-block (**Clark, 1977**)²⁸ appliances. The current concept in orthodontics actively uses extra oral forces to correct skeletal disharmony such as **Facemask** to treat class III malocclusions which was earlier possible only with orthognathic surgery

Advent of Orthognathic Surgery

In 1849, American surgeon Simon **P. Hullihen (1810–57)**²⁹ performed the first recorded surgical operation that could be identified as "orthognathic." He performed anterior sub apical osteotomy to correct anterior open bite and mandibular dento alveolar protrusion. This led to introduction of orthognathic surgeries in the field of orthodontics to achieve esthetic results which were not possible through orthopedic appliances. The surgery in both jaws became common by the mid-1980s, and rigid fixation significantly enhanced the stability of these procedures. The effects of osseous surgery on the soft tissues became a necessary criterion for selecting suitable procedures. **Prof. M.S.N. Ginwalla**³⁰ started orthognathic surgery in India in early sixties and is credited as father of orthognathic surgery in India”

Era of Digitization:-

With the increasing number of Orthognathic surgeries led to development of newer technologies in cephalometrics to analyse hard and soft tissue relationships. Digitization has replaced hand tracing, and informatics systems may deliver comprehensive cerebrospinal research. Hand-drawn predictions of cephalometry were replaced by hard and soft tissue predictions that were developed by the computer. The results of orthodontic surgery were now consistently predictable. Our ability to interpret hard and soft tissue data has been strengthened by Digital X-ray, Photographing and related software programmes. Digitized images and tracking can easily be overlaid and processing simulation software permits the visualization of postoperative predicted effects. Crane-facial anatomy may also be created in the form of cone beam computer tomography, magnetic resonance imaging, Medical Computer Tomography, or 3-dimensional camera systems via a three-dimensional visualization and analysis. In real-time animations, proposed improvements to the soft tissue can now be seen.

Recent Era

In recent decades, a new age has begun with significant improvements and change in paradigms in diagnosis, imaging, therapy and biological concepts of tooth movement. Space gaining can be achieved now by concept of arch expansion, arch lengthening and interproximal stripping. Mini-implants (MIs) have transformed the way we handle anchorage in clinical orthodontics. Several attempts to accelerate tooth movement have been made in recent years. Physical approaches with surgical corticotomy of alveolar bone to **low-energy laser irradiation**³⁰ and **magnetic fields**, as well as pharmacological approaches with **prostaglandin E2 and 1,25 (OH)2 D3 injections**³¹, have been examined. In terms of ideas, biomaterials, and technology, orthodontic features have changed greatly from the Angle to the current Nano robotic age. In the diagnosis, process planning, 3D printing, application systems, digital storage, integration and data recovery, the digital technologies have been widely used. By implementing innovative, new, advanced diagnostic technology such as **CAD/CAM 3D** digital printing systems with intraoral scanners, question of precision is avoided. Various innovations in biomaterials like **Biomimetic adhesives, Self Cleaning materials, Smart brackets, bioresorbable mini-implants and Shape-memory polymers (SMPs)** have been seen in the last decade³².

Conclusion:-

Orthodontics is a science which is evolving dynamically and rapidly. Over the years we have grown more knowledgeable and aware; there is a change in the attitude and the standard of beauty by the common people and orthodontist. This change is dynamic in nature and will be superior with continued efforts. The success of treatment has raised to a substantial level with introduction of new advanced technologies in dental equipment and newer treatment strategies

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