

# ***THE ROLE OF DENTAL TECHNOLOGY IN HEALTH CARE***

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**By**

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## ABSTRACT

*The aim of this short presentation is to define Dental Technology, examine its various components and how these components contribute to health care delivery system.*

*Most people do not know what Dental Technology is and for this reason effort will be made to highlight strategic aspects and give some historical observations.*

*Conceptual clarification will be made about what Dentistry is, as a generic terminology.*

*The areas of health care where Dental Technology is critical aside from Dentistry will be discussed.*

*Ways of maximizing benefits from Dental Technology services will be recommended.*

## **Definition**

Dental Technology is art, science and technology involved in the replacement of oro-facial tissues and their associated structures including bones. Such replacements are called Prostheses. They include the common dentures (partial and full), crowns and bridges, artificial eyes, noses, ears and associated hard structures of the face.

What the Dental Technologist does has been succinctly described by Gasparo Tagliacozzi (1548-1599) when he said "we restore, repair and make whole those parts of the face which nature has given but which fortune has taken away not so much that they may delight the eye, but that they may buoy up the spirit and help the mind of the afflicted".

## **Historical Perspective**

In 18<sup>th</sup> century England sets of square ivory teeth were rich men's adornments! They came out at dinner tables. At about 7000BC Etruscan in Northern Italy made dentures out of human or other animal teeth. These teeth deteriorated fast but being easy to produce were in common use until the mid-19<sup>th</sup> century.

The oldest useful complete denture appeared in Japan in Ganjyoji temple in Kii Province. It was made of certain material called Buxus Microphylla. It was worn by Nalcuioka Tei around April 1538.

In London Peter de la Roche is believed to be one of the operators for the teeth "as they were called then. These men were professional goldsmiths, Ivory turners or students of barber-surgeons.

The first porcelain dentures were made around 1770 by Alexis Duchateau and in 1791 his former assistant Dubois De Chemant was granted the first British patent for "De Chamant Specification" to make teeth.

In 1800, John Lennon a London Gold Smith began manufacturing of porcelain dentures mounted on 18-carat gold plates. In 1890's dentures were made of vulcanite. Cladius Ash company led production of this material in Europe. This material was replaced by methyl methacrylate and other plastics in the 20<sup>th</sup> century.

History of Maxillo-Facial Prosthethics is not much different from that of oral restorations.

It can be traced to Egyptian Mummies who were found to have facial prostheses on them.

Ambroise Pare (1517-1590) a French Surgeon, considered to be the father of modern surgery and his contemporary GasparoTogliocozzi (1546-1599) a plastic surgeon did a lot of work in the evolution of modern facial and general body rehabilitation.

Today prostheses are made of improved methyl metacrylate (MMC) for dentures and silicones for maxillo-facial prostheses. Retention whether intra or extra oral is achieved by incorporation of stainless steel wires, magnets and adhesives.

### **Conceptual Clarifications**

Dentistry contrary to what many believe is a generic terminology like Engineering. It is made up of many branches and therefore a professional in dentistry must specify his own area.

Branches of Dentistry include

- (a) Dental Technology
- (b) Dental Surgery
- (c) Dental Therapy/Hygiene
- (d) Dental Nursing

From the above it will be clear that it may not be completely right and logical to refer to Dentistry as a course.

Dental Technology as branch of dentistry is the focus of this paper. It's role in the team and relationship with other disciplines in dentistry and medicine will be examined.

Apart from dentistry, Dental Technology services are used extensively in:

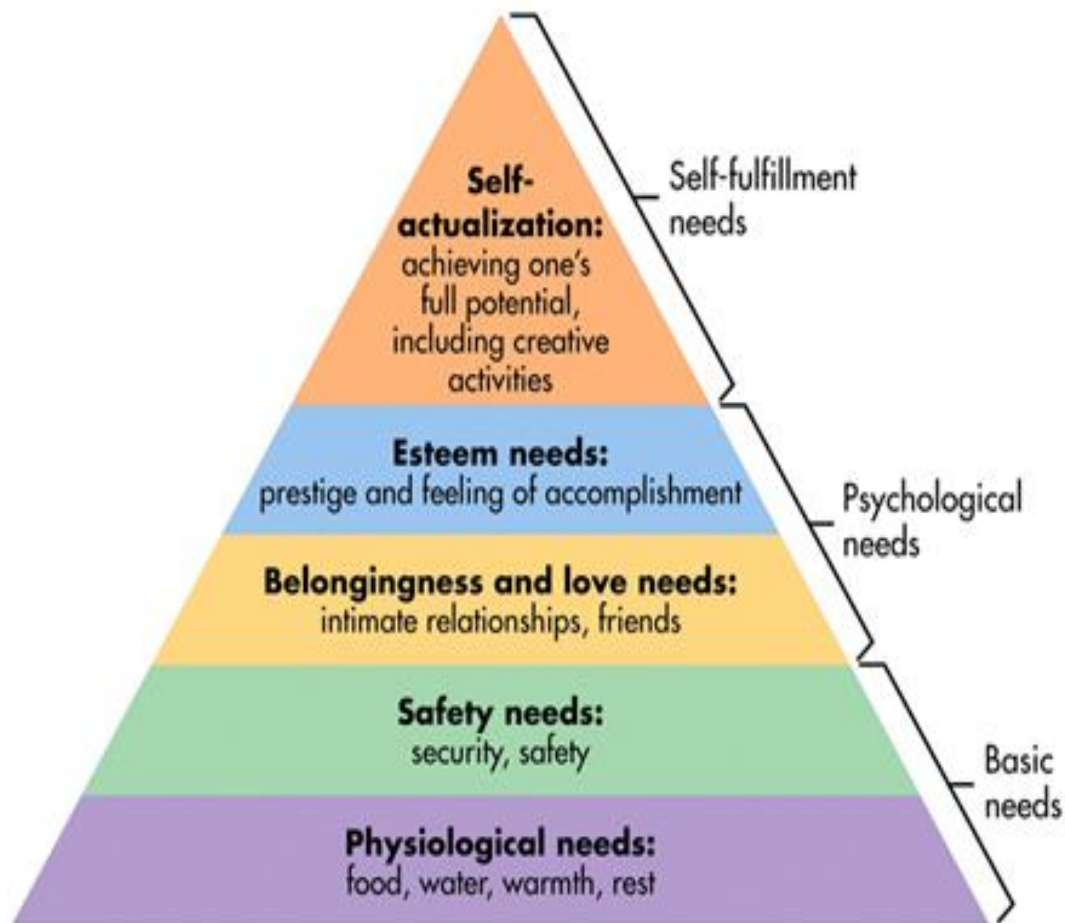
1. Opthamology
2. Paediatrics
3. Plastic Surgery
4. Orthorhinolarynology (ENT)
5. General Surgery

By implication when the surgeon is mentioned in this presentation, it could be from any of the above listed departments and not necessarily dental surgeon.

Dental Technology is domiciled in Dental Centres due to many factors which time will not permit us to look into. The role Dental Technology plays in each of these departments will be explained in course of this presentation.

I think it is incontrovertible that every human being wants to look attractive. Appearance has a lot of effect on personality and achievement. In fact it has been established that attractiveness has some degree of impact on success especially in relationships.

### Abraham Maslow Hierarchy of Needs



**Fig 1: Abraham Maslow hierarchy of needs**

Abraham Maslow (1908-1970) in 1943 in his paper "Theory of Human Motivation" put human needs in a Pyramid popularly referred to as hierarchy of human needs. Facial rehabilitation enhances three of the five groups i.e. Biological/Physiological needs, Belongingness and Love needs and Esteem needs.

Researches in psychology have shown that in the last few decades there has been an increase in demand for improvements in appearance of the face and other parts of the body.

The first area of the body that determine level of attractiveness is the face even before considering general shape of the body. The shape of the face is determined by both external and internal structures of the area.

Internally we have the dentition and its associated components and externally we have what we see on coming in contact with people i.e. the eyes, nose, cheek, chin and ear.

The Dental Technologist replaces all the above named and structures in other parts of the body such as breasts after mamalectomies and even digits.

In order to appreciate the roles played by Dental Technology in Health Care System, the various specialties and their interventions will be discussed.

1. Prosthodontics: (Removable and Fixed) This area deals with fabrication of
  - (a) Full dentures



Fig 2: complete denture prosthesis

(b) Partial dentures (Fixed and Removable)



Fig 3: metallic base partial denture framework (lower and upper)

A full denture is a prosthesis replacing all the teeth on a jaw and it could be for one or both jaws.

A partial denture is one replacing one or more teeth on a jaw where one or more teeth are standing. This could be removable in which case the base is made of acrylic resin or a skeleton structure made of cobalt chromium or other alloys.



Fig 4: Mal-aligned teeth resulting in over closure.



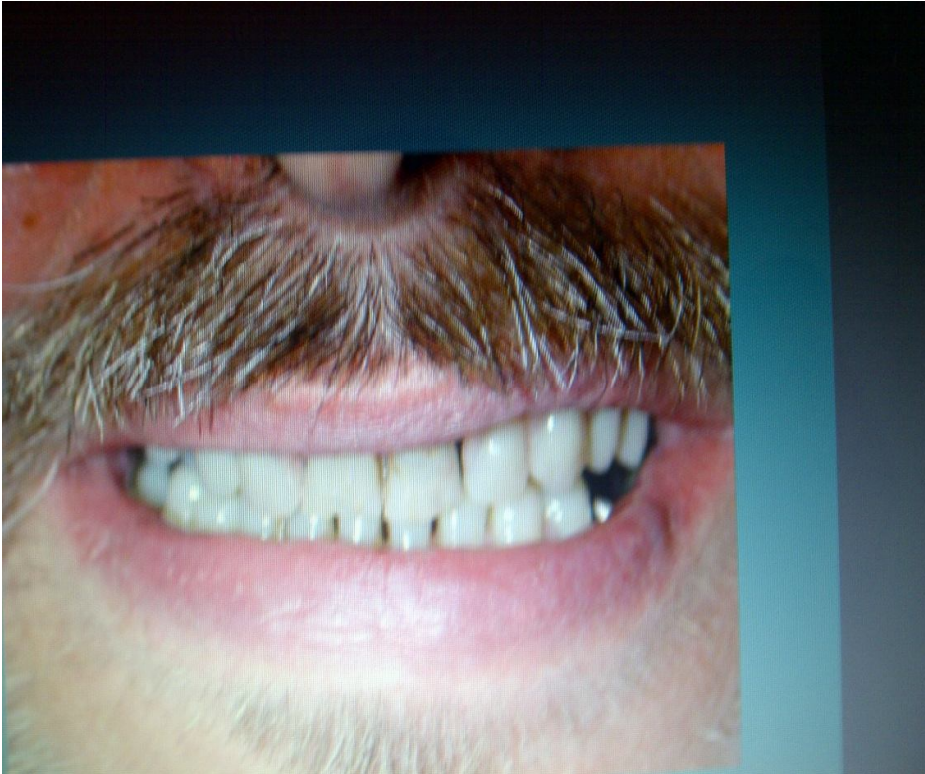


Fig 5: figure 4 after rehabilitation

A fixed partial denture could be a crown when it replaces only the enamel or enamel, dentine and pulp of a tooth. It could also be a bridge when a completely lost tooth or teeth are replaced using the abutments as retainers.

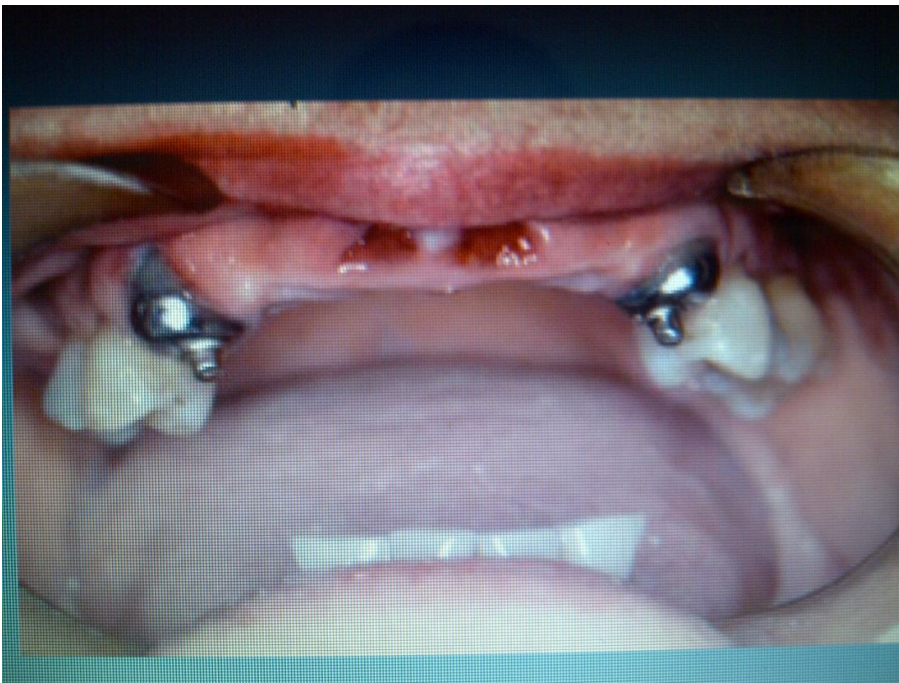


Fig 6: partially edentulous upper with prepared retention abutments



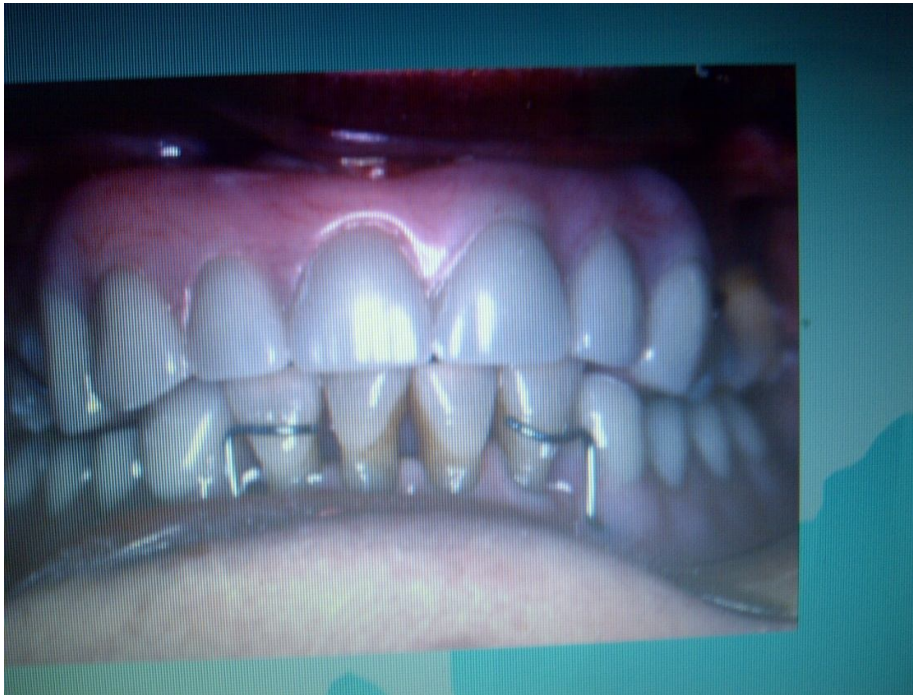


Fig 7: figure 6 after restoration

This can be made of acrylic or porcelain facing and alloy backing or complete porcelain depending on the span. The principle of design of this appliance is same as that of a bridge in Engineering.



Fig 8: Examples of bridge on the left and crown on the right

The choice of whether to use fixed or removable depends on patient's choice and financial capability, fixed dentures are more expensive.

CAD/CAM have been introduced in this aspect of restoration but the dental technologist still has to programme and operate the hardware.

### **Indications for Denture**

Dentures are necessary for many reasons some of which are:

- (1) To maintain ideal facial profile. Loss of teeth brings the jaws into abnormal relationship which distorts the normal profile. They enhance aesthetics and attractiveness.
- (2) Mastication: Teeth are the only instrument for this purpose in the human body, others aid the teeth.
- (3) To aid some physiological functions such as swallowing. Most people do not know that teeth or both jaws have to be in occlusion before swallowing can take place. Where there are no teeth for this purpose swallowing becomes difficult. It is impossible to swallow with the jaws apart.

Some of these functions are performed in conjunction with the dental surgeon.

### **Orthodontic Technology**

This is an aspect that deals with the construction of appliances to correct malpositioned teeth and jaws. It also comprises of both Removable and Fixed. The removable appliances are the ones within the purview of Dental Technology.

The removable appliance consists of the base usually in acrylic and other components in different gauges of stainless steel wires. They could also carry expansion screws and planes to enhance or accelerate movements in desired and predetermined direction.

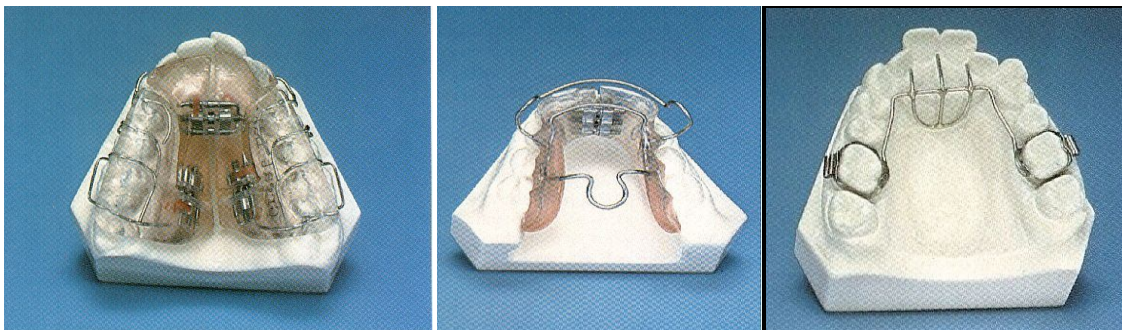


Fig 9: orthodontic cases for correction of malpositioned teeth

Others include Myofunctional appliances which forces jaws into ideal relationship through forces exerted by the appliance and the tone of surrounding muscles.

The commonest of the removable appliances is the Hawleys which are constructed to retract proclined anteriors especially the uppers. These are braces we see in mouths of some adolescents. Orthodontic treatments are advisable before the age

of twenty. Fixed appliances consists of bands and are purely clinical processes. Whichever option is adopted, orthodontic appliances are therapeutics and temporary. Some of the wires seen in adolescents mouths are removable orthodontic appliances made by the Dental Technologist.

### **Maxillo-Facial Prosthetics and Technology/Anaplastology**

This is another important area of intervention of specialized Dental Technology service. Functions in this area transcends dentistry as they involve departments earlier mentioned.

This is the aspect that deals with the replacement of extra and intra oral structures lost to surgery, trauma or pathology. Such parts include the eye, nose, ear, part of the jaw fingers and even breasts.



Fig 10: An Obturator



Fig 11: Pre-Auricular restoration



Fig 12: Post-Auricular restoration



Fig 13: Pre-Hemimaxillectomy Rehabilitation



Fig 14: Post-Hemimaxillectomy Rehabilitation





Fig 15: Pre-Rehabilitation



Fig 16: Post-Auricular Rehabilitation





Fig 17: Pre-Ocular Rehabilitation



Fig 18: Post-Ocular Rehabilitation



Fig 19: Pre-Ocular Rehabilitation



Fig 20: Post-Ocular Rehabilitation



Fig 21: Pre-Neonatal Rehabilitation



Fig 22: Post-Neonatal Rehabilitation

Prosthetic rehabilitations are indicated under the following circumstances:

1. Where no alternative is available as in the replacement of the eye. Surgical intervention may not be visible.
2. Where surgery takes a second place in terms of procedure and resultant aesthetics such cases include replacement of the ear (pinna) and the nose.

This concept was corroborated by a renowned Maxilla-facial and Prosthetic Surgeon B.K. Rank in 1954 when he said "critical consideration of surgical

probabilities rather than wishful thinking of possibilities should in due humility and without any sense of same lead us to advise the fitting of a prosthesis for many cases”

3. When the patient is too old to undergo surgery and its associated procedures.
4. Some religious sects forbid blood transfusion which is an essential component of most sophisticated surgical procedures. An example of such sect is the Jehovah Witnesses.
5. When the patient has no choice. It is only one facility that is available i.e. either surgery or prosthetics.

As a matter of fact these specialist Dental Technologists are also called Anoplastologists. They replace parts of the body outside the maxillo-facial region such as the areola and nipple and whole breasts and digits (fingers).

Application of maxillo-facial technology in the rehabilitation of parts already mentioned are dependent on other factors which are not within the scope of this presentation.

## **Conclusion**

From the few aspects highlighted in this presentation, we can deduce the vital role of this service in physiological, psychological and sociological well-being of an individual. One needs to meet patients using these prostheses in order to appreciate the indispensability of these artificial substitutes.

## **Recommendations**

For the citizenry of this country to benefit maximally from the application of this technology, government should

- (1) Train more professionals in this area in order for the services to reach most part of the country. It might be shocking to note that only this institution trains dental technologists to first degree level in the whole of West Africa.
- (2) Facilities should be provided in major hospital for the professionals to practise. Most so-called dental facilities are empty both in terms of manpower and equipment.

- (3) In my experience, most deformed people are not aware their deformities can be corrected. Therefore more efforts should be made to create awareness about services available from these professionals.
- (4) Practitioners should try to produce prosthesis of high quality because a badly-made prosthesis is worse than no prosthesis at all.

I thank you for your attention and time.

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