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RESEARCH ARTICLE

FABRICATION OF SILICONE AURICULAR PROSTHESIS RETAINED BY CUSTOMISED SMOOTH SURFACE TITANIUM IMPLANT IN BURN PATIENT.

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Abstract

Pinna loss is not uncommon due to accident, burn, or defect resulting from congenital malformation. Auricular prosthesis are generally fabricated by PMMA or silicones and usually retained by spectacle, hairband, adhesives etc. Loss of soft tissue and thinning of superficial skin due to burn creates a lot of problems related to retention of conventional auricular prosthesis especially in temperate zones. Cortical bone thickness in mastoid area remains a hope for placement of titanium implants in these patients. Conventional two piece implants have a major drawback that is causes recurrent peri-implant skin infection in burn patient which may lead to constant irritation or implant failure. It is because of two major reasons one being the transition zone between implant body and abutment and other is surface roughness of implants. To avoid this in present case customised single piece smooth surface wide neck implants were used so that thin skin after burn do not get soggy and inflamed to compromise the prognosis. The external auditory meatus (EAM) always serves as a reference to locate clear acrylic stent. Diagnostic procedure done to confirm locations of implants using high resolution computed tomographic scan of temporal bone with radiographic auricular stent. Fabrication of silicone auricular prosthesis using cast bar and clip system as retentive aid has been described.

Introduction:-

Loss of external ear in burn is an acquired deformity which leads to stress and affects mental, social and psychological balance of the patient. The incidence of skin infection increases with burn patient, irradiated patients, skin mobility, as well as poor local hygiene with deposits around the implant. After burn skin become very thin with compromised blood supply which is a major factor responsible for recurrent inflammation and infection so it create a challenge for maxillofacial prosthodontics.(1,2) The need of the patient must be assessed by history followed by careful clinical examination of the defect. This assessment must include underlying bone nature and thickness, overlying soft tissue, residual ear remnants, quality of skin, scarring, position of hairline, air cells and superficial temporal nerves and vessels. Use of adhesive, eyeglasses, hairband for the retention of the prosthesis does not give satisfactory results. It is because of the inadequate bonding of the prosthesis to the skin, skin damage and difficulty with prosthesis positioning. A relative indication of smooth surface single piece implants in cases with severely compromised tissues due to burns or trauma. Gold standard treatment in such pinna replacement remains full thickness graft reconstruction by a surgeon, however, it require multiple surgeries and is expensive.[7,8,9] Implant

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retained auricular prosthesis has advantage because surgical procedure is short and simple. Surgery can be performed in local anesthesia with less morbidity. In 1960 silicone material was introduced since then it remains material of choice for auricular prosthesis because of its resilient nature, consistent performance, light weight, flexibility & superior esthetics. [4,5] Major disadvantage with silicones are low wear/tear resistance and its colour fades off, therefore need frequent replacement. The principle purpose of this article is present a simple, effective and economical technique to replace a missing pinna due to burn by silicone auricular prosthesis retained by two customised commercially pure titanium single piece smooth surface implants through a Co-Cr cast bar.

A case report

A 23 year old burn male patient was referred to department of prosthodontics, faculty of dental sciences by the department of plastic surgery IMS BHU with a chief complaint of poor looks due to loss of right ear and hearing impairment. Clinical examination and history revealed that the patient had met gas-cylinder explosion in his home leading to burn and scar formation. (fig. 1) The right side tragus region had a skin fold around opening of external acoustic meatus. Contralateral ear was normal. Medical history revealed no significant findings, and on psychological assessment patient found to be of low expectation. Clinical examination revealed loss of pinna on right side, contracture and remnant of pinna which was advanced & sutured around the external auditory meatus by plastic surgeon.

Diagnostic impression technique

References lines were marked on the defect site through patient's face by indelible pencil from contra-lateral ear. Three reference points were marked. First line was drawn from the lateral canthus of right eye to locate superior border of helix. Second point marked 10mm posterior to TMJ to locate superior border of tragus. Third reference was EAM. Diagnostic impression was made with alginate, cast was prepared and the markings were transferred on the cast for orientation of the radiological and surgical stents. Gutta percha points were used as radiopaque marker in acrylic stent in arc of circle located 18mm from EAM to locate vital structures, thickness and density of cortical bone [3].

Radiological procedure

High resolution computed tomography (HRCT) of temporal bone with radiographic stent in place was done to evaluate the thickness of cortical bone above air cells of mastoid process to decide location number, length and diameter of customized implants. Superior areas beyond the chosen locations were also calibrated but but ct scan readings showed the risk to injured middle cranial fossa. Inferior areas didn't show sufficient bone thickness. Thickness of cortical bone was found to be 5.09mm above mastoid air cells on marked locations. Density of bone was of d1 type. Hence position, number, thread design, diameter and length of implants were decided accordingly. The commercially pure single piece smooth surface titanium implants with v-shaped threads of 6mm in diameter and 5mm in length were customised.

Surgical procedure

Based upon clinical and imaging findings preoperatively skin is incised down to periosteum and a skin flap was raised to place implants into the bone. The greater auricular nerve and lesser occipital nerve block was given by administering lignocaine with adrenaline (1:80,000). After raising the flap the sites were located by surgical stent, osteotomies were made by intermittent drilling in the bone with continuous copious irrigation by cold normal saline to prevent overheating & charring of bone. Pilot drill of 2-mm diameter at 1000 rpm was used for initial entry. The subsequent drilling was done with 2.8mm, 3.2mm, 3.65mm, 4.2mm and 4.8mm. Two customized titanium single piece smooth surface implants of diameter 6mm and 5mm length were placed after osteotomies were finished. Two implants were sufficient for perfect stabilization of the prosthesis.

The flap was repositioned and sutured with 3-0 vicyl to limit exposure of subcutaneous tissues. Iodoform gauze dressings were applied. Medical protocol includes 2g amoxicillin prophylactic and 625mg TDS, calcitriol 500 mg per day, paracetamol for relief of pain for 2 weeks postoperatively.

The sutures were removed after ten days and the patient had no complain of pain or any other problem in the post-operative period. The gauze dressings were changed weekly for a period of two weeks. Cleaning the debris by swab in soap water was adviced. The prosthesis must not be worn until complete resolution of the infection. After two months patient was recalled for prosthesis fabrication.

Prosthetic phase

The implant impression was made by using poly-vinyl siloxane (flexceed GC) in putty consistency with light body injected during maximum mouth opening with the use of mouth props. Functional impression technique was used to maintain skin contact at all movements. The abutment part of the impression was poured with pattern resin. Metal bar was fabricated and the plastic clip attachment was attached on the bar for retention of the prosthesis. Acrylic housing (substructure) was made over the bar-clip attachment. Fabrication of wax pattern was done by making similar right ear impression of donor and impression was poured with wax, sculpting the wax pattern by hand carving and adjusted on acrylic housing. The flasking of the wax prosthesis was done by a specialized three pour technique, de-waxing and packing with (Technovent) silicone. Extrinsic stains were used for color matching which is usually required to create the final silicone prosthesis. Patient was educated to hold the acrylic housing during removal of the prosthesis so that plastic clip do come along with acrylic housing and increases the life of prosthesis. After two months, the implants were loaded with the bar-clip system, and prosthesis was delivered. The home care instructions regarding maintenance of the prosthesis and the soft tissues around the implants consisted of daily use of soap and water, along with mechanical cleaning of the abutments and connecting bar, using a soft toothbrush.

Discussion:-

Maxillofacial defect may be congenital or acquired, but absence of ear due to any reason makes the individual to lead a stressful life ahead and necessitate the surgical or prosthetic reconstruction. The choice between surgical reconstruction and prosthetic restoration of auricular defect, the prosthetic restoration is the better option than surgical reconstruction because of consistent good result. Different technique for fabrication of auricular prosthesis has been proposed but digitizing imaging technology like cad/cam is better than conventional method. Unfortunately this technique generally needs highly equipped, well developed institutions. In our institution conventional technique is commonly used for silicone ear prosthesis. It is very important to orient the position of wax ear before fabricating silicone prosthesis. Temporomandibular joint serves as a reference because the superior aspect of the tragus is most commonly located 10 mm posterior to the temporomandibular joint. Habakuk et al [15] suggested making references lines by indelible pencil to orient the position of wax ear on the defect site with contra-lateral ear. Skin losses contact with anterior margin of the silicone prosthesis during mandibular condyle movement and soft tissue associated with change in head position can result in exposure of anterior margin of the implant retained auricular prosthesis. [16] the design of the fitting surface should only allow for prosthesis-skin contact at the anterior and conchal margins and the posterior conchal margin must include an aeration channel. The anterior margin is adapted by scraping the master cast and then smoothing the area with sandpaper.

The application of osseointegrated implants has dramatically improved retention and improved aesthetics. On the contrast, adhesive-retained prosthesis can produces inflammation and loss of extrinsic strain be placed immediately on a healthy tissue bed, but can be done without surgery and is cost-effective [20, 21, 22] in post burn tissues, skin infections like slight redness, reddened and moistened peri-implant tissues, granulation tissue associated with the implants or infection of the peri-implant soft tissues are more frequent and harder to treat. Peri-implant skin is susceptible for infection and is a serious issue in 15 to 20% of patients.[6] therefore single piece machined implants were used as there was no tissue-ingrowth due to lack of junction which minimises the rate of peri-impant skin infection. Staphylococcus aureus, streptococcus species, and gram-negative bacteria [6,10,11,12,13,15] are main microflora around implant skin.

Burn tissues are also less resistant to wound pressure ulcers. The frequency and degree of adverse skin reactions have been seen to decrease with time. [23, 24] Good patient hygiene compliance combined with thin and immobile peri-implant soft tissues have been found to result in minimal soft tissue complications [17, 18, 19].

Conclusion:-

The surgical technique for auricular prostheses retained on osseointegrated implants seems to be simple, provide maximal retention, superior esthetics and less strain on patient. It is also associated with minimal intraoperative and long-term complications as compared with conventional adhesive and mechanical techniques. Color stability is also good as compared to adhesive retained silicone prosthesis. The major disadvantages are the lifelong daily skin care, renewal of the prosthesis after every 2 years, and dependence on the health services that are required. Osseointegrated titanium implants may provide patients with a safe and reliable method for retaining auricular prostheses that enables restoration of their normal appearance and offer an improvement in their mental, psychosocial well-being and overall quality of life.

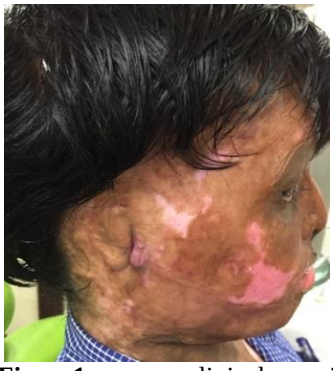


Figure1:- pre-op clinical examination

Figure 2:-Final silicone ear prosthesis delivered

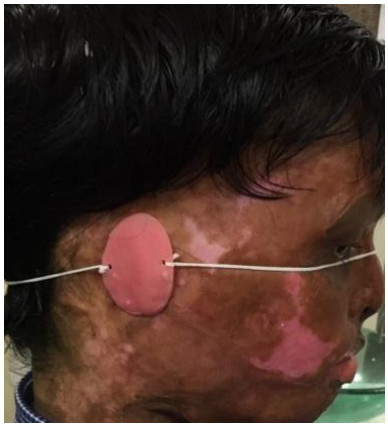
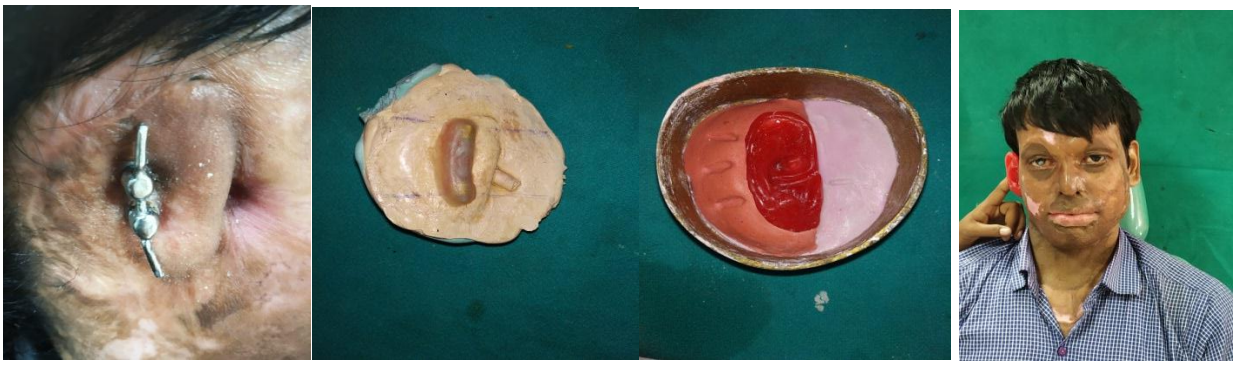


Figure 3:-Acrylic stent with radiopaque marker at an arc of 18mm FROM EAM.
Figure 4:-Stent placed with elastic band for CT scan.
FIGure 5:-CT scan showing thickness of cortex approx. 5.09mm.

Figures 6:-periosteum elevation & retractor placed.
Figures 7:-Osteotomy made with subsequent drilling.
Figures 8:-Implant placement done.
Figures 9:-Suture placed.



Figures 10:-Cast bar fabricated & tried in patient for fit
Figures 11:-Acrylic housing made over clip attached cast bar.
Figures 12:-Flasking by three pour technique.
Figures 13:-Wax ear try-in done

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