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Versatility of Alloplastic Material to Recontour Facial Deformities

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Abstract

Introduction: There are multiple congenital and acquired causes of facial deformities. To restore the facial contour various autogenous and alloplastic substitutes have been suggested in published literature.

Aims And Objectives: The aim of this study is to assess the versatility of porous high density polyethylene(pHDPE) alloplastic material for correction of residual deformity and its effect on biological tissue.

Material and Methods: In this study 30 patients with secondary deformity have been included and were rehabilitated using pHDPE. The deformity was restored and patient was kept on follow up . Assessment was done based on various clinical parameters.

Results: pHDPE implant was fixed to various maxillofacial sites. It was found to be stable in all the patients except in one for malar augmentation. There was no tissue reaction and implant material proved to be versatile in 96.6% cases.

Conclusion: This alloplastic material proved to be versatile for residual deformity correction. Its advantages of ease of handling, no donor site morbidity proved it to be acceptable over autogenous grafts for restoring facial contour.

Keywords: High Density Polyethylene, Alloplastic Material, Facial Deformity, Versatility.

Introduction

Facial reconstruction becomes mandatory from functional and aesthetic point of view. There can be various congenital causes including hemifacial microsomia, TMJ ankylosis, midface hypoplasia resulting in facial asymmetry. Acquired facial deformity may result from post surgical defect including tumor resection, stunted growth as a result of trauma, mandibulectomy etc. Orbital defect as a result of trauma are another commonly encountered deformity to be reconstructed. Basic aim of reconstruction is to restore the normal bony and soft tissue architecture and function if altered.

Multiple options have been suggested for correction of such deformity including autogenous allogenic and alloplastic bone grafting. Autogenous bone grafting is considered as gold standard option but has an added

disadvantages of donor site morbidity[1]. Multiple alloplastic materials have been evolved that have overcome the above mentioned demerits.

In this study we would like to highlight the versatility of an alloplastic material i.e. porous high density polyethylene in correction of facial deformity.

Material and Method

30 patients with facial deformity, who reported to the department of oral and maxillofacial surgery were included in the study. Amongst them 17 were females and 13 were males. The age ranged from 21 to 45 years , mean age being 33 years . 5 patients had right side mandibular angle defect, 4 patients with left side mandibular angle defect, 7 patients had malar deficiency, 3 patients had orbital floor defect, 8 patients had hypoplastic chin and 3 patients with frontoztgomatic deformity. Most deformities were acquired ones, mostly post traumatic. Few were developmental eg hypoplastic chin as a result of TMJ Ankylosis. In all these patients porous high density polyethylene implants were used to augment the deficient facial region. Then the followup was done at 3 months, 6 months and 1 year. The study was based on subjective analysis. Parameters used to evaluate the efficacy of the implant were facial symmetry, patient satisfaction, stability, adaptability, biocompatibility(table 1). Patients were kept on followup and were also evaluated for the occurance of complication including implant exposure, wound dehiscence, infection, palpability(table2). The study was commenced after getting clearance from instituitional ethical committee.

Surgical Technique

After complete clinical and radiographical evaluation (fig 1, fig 2) patients were selected for deformity correction using porous high density polyethylene . Necessary hematological, biochemical and serological tests were done for all patients preoperatively which came out to be within normal limits. Informed consent was taken. All the patients were treated under general anaesthesia. After taking all aseptic precautions deformity site was then exposed by either intraoral or extraoral approach depending upon the anatomic location (fig 3). Medpore (pHDPE) implant was contoured by immersing it in hot water. It was then adapted on a deformed bony surface. Excess margin were shaved and then carved. It was then fixed to the underlying bone using titanium screws (fig 4). Soft tissue closure was done in layers. Patients were then kept on follow up for further evaluation.

Table1: Table to Evaluate the Efficacy

S.No	Site of implant	Number of patients	Symmetry	Stability	Biocompatibility	Patients' satisfaction
1	Right angle of mandible	5	adequate	adequate	No tissue reaction	good
2	left angle of mandible	4	adequate	adequate	No tissue reaction	good
3	Malar process	7	adequate	Inadequate in one patient	No tissue reaction	Poor in one patient
4	Orbital floor defect	3	Inadequate in one	adequate	No tissue reaction	good

			patient			
5	chin	6	adequate	adequate	No tissue reaction	Good
6	Frontozygomatic region	3	adequate	adequate	No tissue reaction	Good

Table 2: Table To Evaluate The Occurance Of Complications

S.No	Site of implant	No. of patients	infection	Implant exposure	palpability	Wound dehiscence
1	Right angle of mandible	5	Absent	Absent	Absent	Absent
2	left angle of mandible	4	Absent	Absent	Absent	Absent
3	Malar process	7	Present in one patient	Present in one patient	Absent	Present in one patient
5	Orbital floor defect	3	Absent	Absent	Absent	Absent
6	chin	8	Absent	Absent	Absent	Absent
7	Frontozygomatic region	3	Absent	Absent	Present in two patients	Absent

Results

High density polyethylene was used in 30 patients at different facial regions. Results were evaluated on the basis of clinical evaluation. Implant was found to be stable in all the patients (96.6%), except in one patient where hdpe was used to augment the malar region (table 1). Instability was due to loosening of fixation screws and wound dehiscence. Adequate facial symmetry was achieved in all the patient and contour defect was restored adequately. Implant palpability was seen in 2 patients where it was fixed in fronto zygomatic region.The complications encountered were manageable. After evaluating all the parameters it could be said that implant material proved to be biocompatible without any soft tissue reaction(fig 5).

Discussion

For correction of facial deformity, autogenous , allogenic and alloplastic grafts have been suggested since ages.. Autogenous graft include bone and cartilaginous graft from local or distant sites. These possess osteoinductive properties. But as already mentioned they have demerit of donor site morbidity.

Allogenic graft shows osteoconductive properties and facilitate the soft tissue ingrowth[1]. According to the published literature, allograft have shown comparatively success ful results as that of autograft[2,3]. The only reported shortcomings of allograft are transmission of infection and antigenicity[1,4] . It also shows increased resorption as compared to autograft. These various pitfalls in autogenous and allogenic graft led to the evolution in the development of biomaterials. Alloplastic material started gaining popularity for reconstruction purpose because of reduced morbidity and easy manipulation.

Properties that should be possessed by a biomaterial to be ideal include biocompatibility, nonallergic, ease of handling, chemically inert, radio opaque, and should mimic the host tissue.

Alloplastic material satisfy the above mentioned criteria, therefore preffered over other grafts. Available alloplastic material can be resorbable and non resorbable. Resorbable alloplastic materials are polylactide, polyglactin, polydioxanone etc. Nonresorebable materials include metallic titanium mesh, nylon suprafoil, hydroxyapetite, silicon, and polytetra fluoro ethylene.

One such material is high density porous polyethylene. It is highly biocompatible, non resorbable, insoluble in tissue fluid. pHDPE has a pore size of 100-200 microns[5,6]. It facilitates the in growth of fibrovascular tissue, thereby increasing the acceptability and fixity of implant, reducing the chance of infection[6].

It has got good tensile strength and can be adapted to the bone surface. pHDPE has similar hardness as compared to the cancellous bone[7]. But this material also exhibits thermoplastic properties with the v irtue of which it can be contoured or moulded easily[8]. It has also been noticed that when this implant is fixed to stress bearing area, small particles are shed off which may induce chronic inflammatory response[9]. One reported limitation of pHDPE is its low modulus of elasticity, viscoelastic behavior, and poor bioactivity. This has been improved by adding hydroxyapetite or carbon nanofillers to form hdpe composites so as to improve the creep behavior of polyethylene[10].

It is available in sheets, blocks and prefabricated shapes(fig 6, fig7).

To reduce the incidence of infection, the implant should be immersed in the antibiotic solution . In our cases we have preferred immersing it in inj ceftriaxone for 30 mins prior to the placement. It can either be simply soaked in antibiotic solution or vaccum assisted impregnation technique can be done. Vaccum assisted technique has shown 10 times better impregnation as compared to simple soaking[11].

We used hdpe at various sites . Most common was the chin augmentation which was successfully achieved . Implant did not get infect in any case. Only complication that we encountered was the palpability at frontozygomatic region. Wound dehiscence was seen in 3 patients that was then secondarily closed. Long term followup results were satisfactory.

Hdpe was well accepted in orbital floor reconstruction. The efficacy of hdpe was studied by wang etal[12] for orbital reconstruction they achieved significant improvement in aesthetics and function.

Rai et al conducted a similar study for facial reconstruction using HDPE in 21 sites and achieved good aesthetic and functional restoration[13].

Hdpe has also been suggested to be used for correction of temporal hollowing following transposition of temporalis myofacial flap for reconstruction purpose[14].

Initially silicone polymers were used ,but they showed resorption of underlying bone[15]. HDPE was modified by embedding the sheet of titanium in porous polyethylene enhancing the strength and radio opacity[1].

Conclusion

HDPE is an excellent option for facial deformity coreection.The ease of handling, easy surgical technique and rare incidence of implant rejection, minimal morbidity has made it more acceptable over auto grafts.

Legends Figure and Tables

Fig. 1: Preop image showing loss of mandibular angle projection on right side

Fig. 2: Image showing mandibular defect with reconstruction plate adapted on right side.

Fig. 3: Image showing mandibular defect with reconstruction plate adapted on right side.

Fig. 4: pHDPE implant fixed to the angle of mandible

Fig 5: Follow up image showing restored mandibular angle contour on right side.

Fig 6: Chin implant

Fig 7: Implant in the form of sheets.

Table 1: Parameters to evaluate the efficacy

Table 2: Table to evaluate the occurance of complications

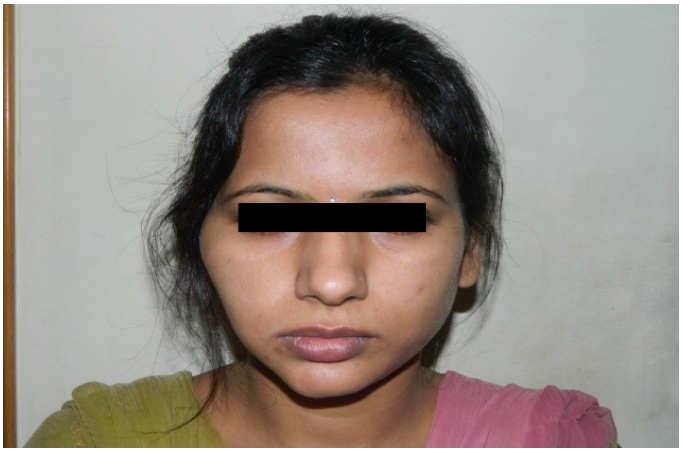

Fig 1: Preop image showing loss of mandibular angle projection on right side

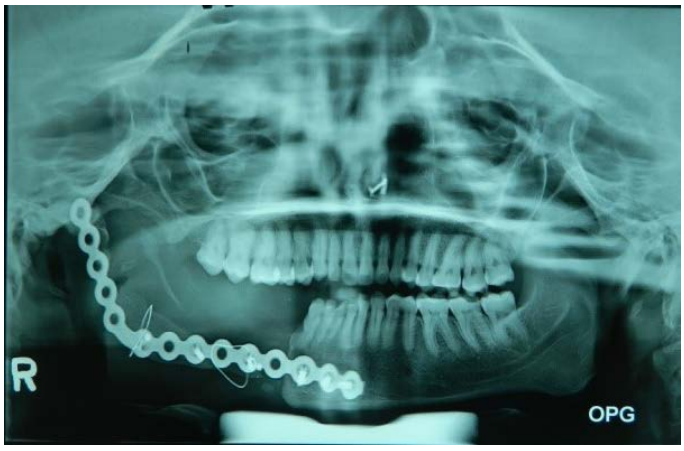

Fig 2: Image showing mandibular defect with reconstruction plate adapted on right side.

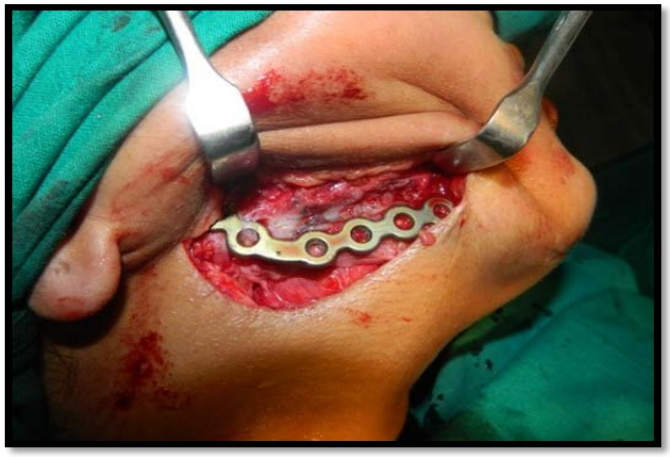

Fig 3: Image showing mandibular defect with reconstruction plate adapted on right side.

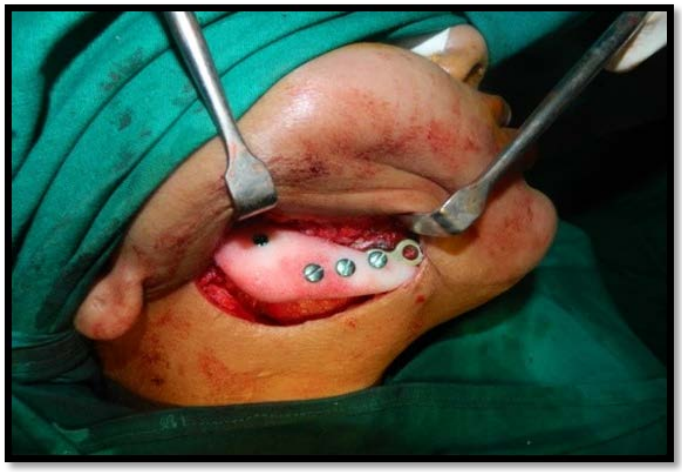

Fig 4: pHDPE implant fixed to the angle of mandible

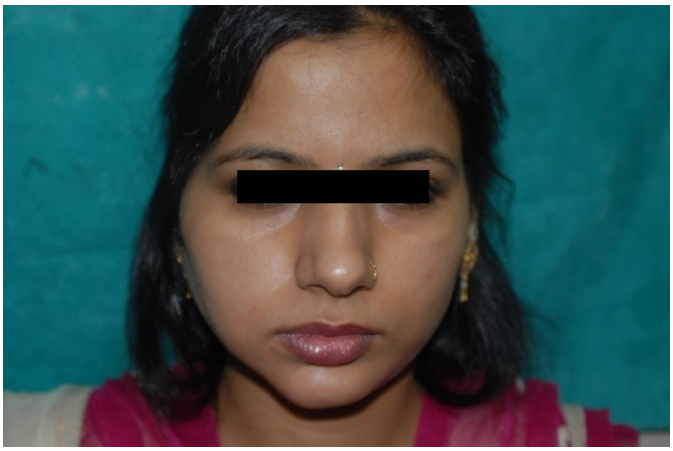

Fig 5: Follow up image showing restored mandibular angle contour on right side.

Fig 6: Chin implant

Fig 7: Implant in the form of sheets.

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