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BIORESORBABLE PLATES IN PEDIATRIC FACIAL TRAUMA: A REVIEW UPTO- 2011

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ABSTRACT

Pediatric facial injuries present a unique challenge for any operating surgeon owing to the plethora of nuances associated with their management. Furthermore varied schools of thought and ever increasing advances being made in the sciences of biomechanics and biomaterials are adding to the pre exiting dichotomy of to be or not to be, as much as they are affecting the treatment guidelines

The present review is focused on the issue of use of bio-resorbable plates in cases of pediatric facial trauma as an attempt to lessen the confusion with regards to the analogy of metallic bone plating systems , in the light of concurrent research across the globe.

This review article is based on the data base of Pubmed®, assessing the ongoing development in contemporary Pediatric Dentistry 'Oral and Maxillofacial Surgery along with Plastic and Reconstructive surgerydata base of Pubmed®, assessing the ongoing development in contemporary Pediatric Dentistry Oral and Maxillofacial Surgery along with Plastic and Reconstructive surgery

Key Words: Pediatric facial injuries, Surgery, Dichotomy

INTRODUCTION

Five percent of all facial fractures occur in children making these injuries relatively infrequent. Surgical intervention is contemplated only when gross functional or esthetic problems ensue. **Triana et al (1998)**[1] have demonstrated excellent results using resorbable plates for management of isolated zygomatic complex fracture. Their argument of preferring bio resorbable system over conventional miniplates is that healing in children is so rapid that very rigid fixation is not required.[7]

Kumar et al (1998)[2] evaluated the application of bioabsorbable fixation devices in reconstructive craniofacial procedures in the **pediatric** population. They reviewed 22 cases in which bioabsorbable **plates** and screws were used in craniofacial surgery for reconstruction. The procedures were performed in a 7-month period. The patients ranged in age from 5 to 228 months at the time of surgery (mean, 76.7 months). The postoperative clinical follow-up ranged from 2 to 16 weeks. The fixation devices were evaluated with regards to satisfactory fixation at the time of procedure. The postoperative follow-up evaluated clinical wound healing, signs of infection or local inflammation, and visibility or palpability of **plates** through the skin. All patients except one showed satisfactory wound healing with no sign of infection or local inflammation. The **plates** provided satisfactory fixation and were not visible through the skin. Two patients had **plates** that were palpable at the 4-month follow-up period. One patient with repair of a blow-out fracture of the orbit with **resorbable** mesh had redness and swelling over the wound site 2 weeks postoperatively with resolution 4 weeks postoperatively. Their early experience suggests reabsorbable fixation is an attractive option in **pediatric** plastic and craniofacial surgery. With further experience, this technology may represent the standard of care in reconstruction of the infant calvarium.

Imola MJ et al (2001)[3] sought out to determine the long-term efficacy of **resorbable** plate fixation in **pediatric** patients undergoing craniofacial surgery for congenital anomalies, traumatic deformities, or skull base tumors. Their data supported the use of bioresorbable plate fixation in **pediatric** craniofacial surgery[14] as a means of avoiding the potential and well-documented problems with rigid metal fixation.

Indications include fractures and segmental repositioning in low-stress non-load-bearing areas of the middle and upper craniofacial skeleton. Although there is an initial learning curve in using this technology, we believe the benefits are well worth the effort and represent a major advance in **pediatric** craniofacial surgery.
In their detailed discussion on various treatment modalities **Hauq et al (2003)**[5] have critically evaluated the role of resorbable plate with their indication , contraindications and consequence of using the resorbable plates in pediatric craniofacial skeleton regarded it as a better modality in many respects.

Laine P. et al. (2004)[6] did a retrospective study to asses the complications experienced in patients who have undergone orthognathic surgeries and fixation done using bioresorbable devices. They found that the patient acceptance was excellent and only minor complications were encountered during the follow-ups. They found that bioresorbable devices are safe to be used in orthognathic procedures[11], however, there is a learning curve, as there is with all new methods introduced.

Barry L. Eppley (2004)[4] treated forty-four pediatric facial fractures over a 10 years period using differing technique of polymeric bone fixation. Age range 6 month - 8 years, displaced fracture of symphysis, Para-symphysis, body and ramus underwent open reduction by using 1.5 and 2.0 mm bioresorbable plate and screw. Subcondylar fractures were treated by Short period of maxillomandibular fixation (3 weeks) he concluded polylactic and polyglycolic acid plates and screws can be an effective fixation method for facial fractures in children in the primary and secondary dentition periods. G Enislidis et al. (2005)[13] used bioresorbable plating system to treat Zygomatic fractures. The complications associated with the material were all minors and resolved by conservative measures. They concluded that treatment of Zygomatic fractures with biodegradable osteosynthetic material has no major long term adverse effect.

Geoffrey D. Wood (2005) used the Inion(R) biodegradable plate system to treat the patients with facial fractures; Wood inserted 100 miniplates (68 mandible, 12 zygomatic bone, 3 nose, and 2-thyroid cartilage) the miniplates being made from highly oriented fibers of polymers of PGA and PLA. IMF was recommended for at least 3 days when the plate was used in mandible, for
Zygomatic bone fracture, 1.5mm plates were used and 2.0mm plates for maxillary fractures without IMF. In mandible 2.5mm and later 2.0mm plates were used augmented with IMF for varying period (Median 14 days, range 7-28 days). He found that Inion system was more successful in treatment of maxillary fracture than mandible.

Barry L. Eppley (2005)[4] reported that the resorbable poly lactic and poly glycolic acid plate and screws can be effective fixation methods for facial fracture in children in primary and secondary dentition period. Review of Literature

Kaan C. Yerit et al. (2005)[10] assessed the safety and efficiency of the biodegradable self reinforced bone plates and screws in open reduction and in internal fixation of mandible in children.13 patients were operated on various fracture of the mandible. Follow up time was 26.4 month. Primary healing of the fracture was observed in all the patients. Based on these primary results,self reinforced fixation devices are safe and efficient in the treatment of pediatric mandibular fracture.

Pat Ricalde et al. (2005)[12] did a comparative study the titanium and resorbable internal fixation in a mandibulectomy model by analyzing the force required for plate and screw breakage. Red oak wood board was used to simulate the mandible. Resorbable plates and screws in various configuration where used to stabilize pieces of the wood. They were arranged in 6 different groups. Heating and cooling the resorbable plates prior to strength testing also affected the load-versus-displacement curve. The titanium system we studied exhibited greater resistance to deformation from a vertical load than did the resorbable plate groups.

R. Bryan Bell et al. (2006) reviewed the demographics and outcome of patients with a variety of facial fractures that were stabilized with PL bone plates and screws. The records of 295 consecutive patients with facial fracture treated by open reduction internal fixation, with follow up of 3weeks to 3 years.59 (21%) patients were identified as having received biodegradable plates and screws. All patients eventually went on to satisfactory healing with Review of Literature.

Neumann (2009)[15] published a detailed account in the german literature that compiled well with other authors regarding the biomaterial use in facial region.

CASE HISTORY

The bioresorbable plates are being widely used for correction of osseous defects in child patients. The present case report narrates the implication of bioresorbable plates for fixation of jaw fracture in a child patient aged 14 years who had reported to the out patient department of Chandra Dental College following a road accident on national highway in district Barabanki (UP). The various stagers of fixation are illustrated as Figs. 1,2,3 and 4.

Figure -1 Bioresorbable Plate ready to be used

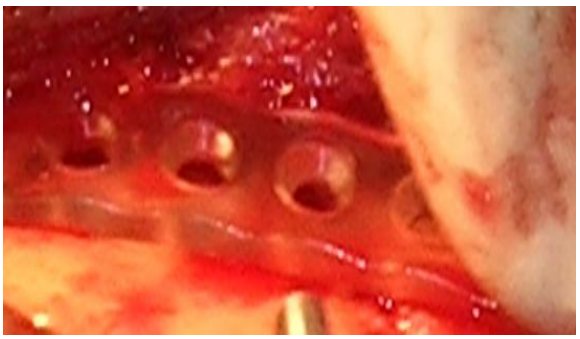

Figure2, Plate in SITV, Post Reduction & Plate Adaptation

Figure-3 Plate with Screws

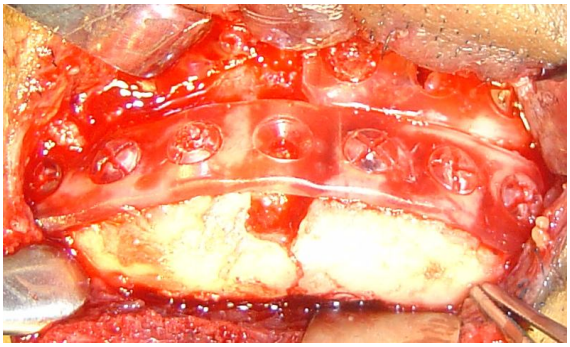

Figure-4 Final Position of Plate with Screws

Biomaterials for reconstruction of bony defects of the skull comprise of osteosynthetic materials applied after osteotomies or traumatic fractures and materials to fill bony defects which result from malformations, trauma or tumor resections. Other applications concern functional augmentations for dental implants or aesthetic augmentations in the region of the face. For ostheosynthesis, mini- and microplates from titanium alloys provide major advantages concerning biocompatibility, stability and individual fitting to the implant bed. The necessity of removal of asymptomatic plates and screws after fracture healing is still a controversial issue. Risks and costs of secondary surgery for removal face a low rate of complications (due to corrosion products) when the materials remains in situ. Resorbable osteosynthesis systems have similar mechanical stability and are especially useful in the growing skull. The huge variety of biomaterials for reconstruction of bony defects makes it difficult to decide which material is adequate for which indication and for which site. The optimal biomaterial that meets every requirement (e. g. biocompatibility, stability, intraoperative fitting, product safety, low costs etc.) does not exist. The different material types are (autogenous) bone and many alloplastics such as metals (mainly titanium), ceramics, plastics and composites. Future developments aim to improve physical and biological properties, especially concerning surface interactions. To date, tissue engineered bone is far from routine clinical application.

DISCUSSION AND CONCLUSION

In light of the above findings it can easily be understood that the specialty of pediatric facial traumatology is a tricky one, where the decision of the treatment plan is a multifaceted approach, depending on the age of the patient, site of trauma, type of bone plate, presence or absence

of infection. By and large it has been observed that resorbable plates give better outcome in terms of number of surgeries patient undergoes. The usual complication is loss of strength. . With the multitude of plating systems available, an operator is left with a lot of choice with respect to the composition, longevity and strength of the plate in vivo. Bioresorbable plates are not suited for areas with gross infection as such careful case selection is desired in such places. In case of young children growth was the area of concern with miniplates which is not 1n case with biosorbable plates. Future holds good prospects for resorbable bio materials. Long term studies in this direction are required

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