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Implant Brands Used For Trauma Management In Oral And Maxillofacial Surgery: An Institutional Study

Allour Vaishnavi,
Saveetha Dental College,
Saveetha Institute of Medical and Technical Sciences, Saveetha University,
Chennai 77, Tamil Nadu, India
Email: 151801005.sdc@saveetha.com

Dr.M.P.Santhosh kumar,
Professor
Department of Oral surgery,
Saveetha Dental College,
Saveetha Institute of Medical and Technical Sciences, Saveetha University,
Chennai 77, Tamil Nadu, India

ABSTRACT:
Reconstructing maxillofacial defects is quite challenging for most surgeons due to the region's complex anatomy and cosmetic and functional effects on patients. The use of pre-made alloplastic implants and autogenous grafts is often associated with resorption, infection, and displacement. Recent technological advances have led to the use of custom computer-designed patient-specific implants (PSIs) in reconstructive surgery. The aim of the study was to evaluate the implant brands which are commonly used for trauma management in oral and maxillofacial surgery in our institution.

Materials and Methods:
A cross sectional study was conducted among the outpatient population in Saveetha Dental College, Chennai between August, 2020 and january, 2021. The implant brands used for patients for trauma management in oral and maxillofacial surgery reporting to the clinic. The data was collected using DIAS software and put into an excel sheet and the analysis of the data was made using SPSS software with a chi-square test for association.

Results:
The results showed that most of the males underwent the treatment for trauma management and also used implants to reconstruct it.Among that 60.31% were synthes branded implants, 14.95% of them used stryker brand and 24.74% used stainless steel implant branded material.The most commonly used implant brand was Synthes which is made with titanium .The implants were most commonly done in the patients with the age group of 51-60 years.

Conclusion:
Our study revealed that the most commonly used implant brand was Synthes which is made of titanium. In gender comparison, males had used the Implants for trauma management proportionately higher than females.

Keywords:
Implats, Synthes, Stainless steel, Titanium, Bone, Innovative technology.

INTRODUCTION:

The base metal for dental implants is titanium. The implant's ability to osseointegrate with the bone surface and anchor inside bone tissue allows it to withstand the masticatory load transmitted by the prosthesis. Titanium implants, which include bone plates, screws, and dental implants, have revolutionised the concept of maxillofacial trauma treatment and dentofacial deformities, reconstruction of jaws after ablative surgery and restoration of lost stomatognathic apparatus.(1–3) Cranio-maxillofacial region is a complex structure having structural elements arranged in a series of columns, arches and buttresses with intervening thin bones providing lateral support to primary structural members. (4)(5,6)(5–7) Bone plates and screws when engaged to secure thin plates of bone, fractured bony fragments and osteotomized segments, provide rigid fixations and three dimensional stability of fragments with minimal profile above the bone surface. Moreover approximation, fixation and stabilisation of bony fragments in anatomic alignment promotes healing of bone by primary intention with direct in-growth of capillaries and osteogenic cells across the fragments and thereby restoring the lamellar bone.(4,8) Although bone plates were introduced into Maxillofacial surgery by Christiansen (1945) and thereafter plates borrowed from orthopaedics were modified and employed to manage unstable fractures, but it was only after 1970s that with technological advances, principles of fixation and knowledge of biomechanics was incorporated in bone plates system. (9,10) Initially bone plate implants were fabricated in stainless steel, then in vitallium. Currently the material of choice is Titanium .(11)

The bone plate and screw implant for osteosynthesis are fabricated either in pure commercial titanium or from alloyed form. Titanium and its alloy provide mechanical properties specific for bone plates and screws.(12) A plate is made with lower elasticity, better deformability and lower hardness, so that it can be adapted accurately to anatomic contours whereas screws are fabricated to have higher elasticity and tensile strength and low deformability.(12,13)

Bone plate systems available in Maxillofacial surgery are compression and non compression mini plate type. (14) Another type is a microplate system which is indicated for nasoethmoidal, infraorbital and frontal sinus wall fractures. They can also be used in reconstruction of skull and infant craniofacial surgery.(14,15)

To achieve the higher success rate and bone anchorage, the surface area of implant is increased by plasma spraying either with titanium particles or by hydroxyapatite (HA) coating.(16)

Titanium implants are not available from indigenous sources and the imported system is costly.(16,17) Keeping in view the advantages of biocompatibility, resistance to corrosion, compatible modulus elasticity which is nearer to bone, better mechanical properties and ability to osseointegrate, a project has been undertaken under the aegis of DRDO to manufacture titanium implants within the country so that maximum population is benefited. Our team has extensive knowledge and research experience that has translate into high quality publications(18),(19),(20),(21),(22–31) (32),(33–35).(36,37)The aim of the study was to evaluate the implant brands which are commonly used for trauma management in oral and maxillofacial surgery in our institution. (16,17,38)

MATERIALS AND METHODS:

The single centered study was done among the outpatient population with Implants for trauma management visiting Saveetha Dental College and Hospital, Chennai, India between August, 2020 and january, 2021.

Study sample size:

Total sample data was 300 and after analysis of the inclusion and exclusion criteria, the sample size was minimised to 194. The group selected for the study was Patients who underwent trauma management with Implants.

Data collection:

The DIAS software was used to collect patient records and analyse the data between August, 2020 and January, 2021.The datas collected were cross verified with photographs. Both the internal and external validity is available. Data collection was done using parameters like age, patients with implants.The data that was collected was compiled into a Microsoft Excel Spreadsheet. The age was categorised into groups 1-10 years ,11-20 years ,31-40 years 41-50 years and 51-60 years respectively. It was analysed using SPSS, IBM software, version 23 with chi-square test. p value was set as 0.05 as the level of significance.

RESULTS:

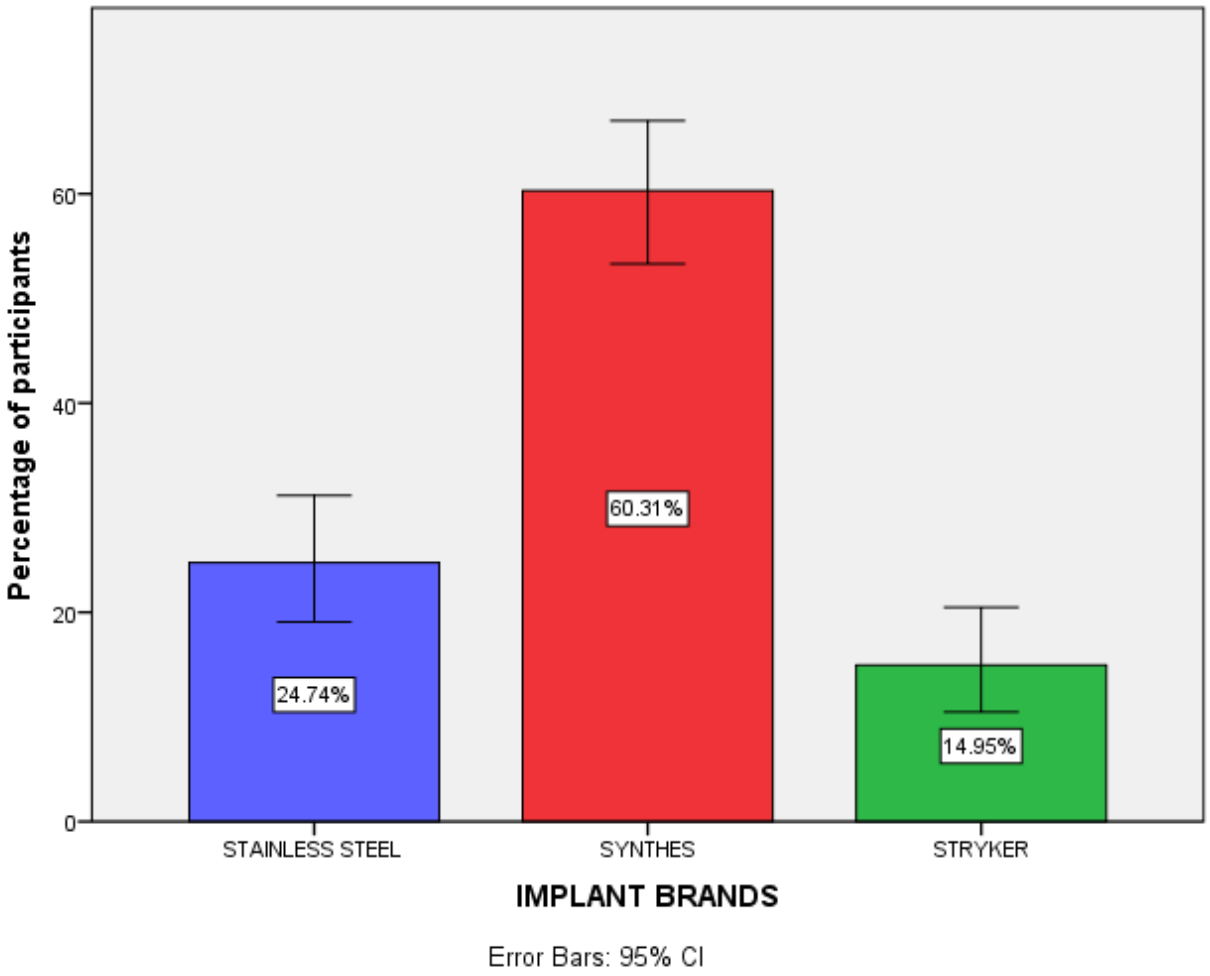

Figure 1 shows the types of implant brands used for trauma management in the patients.

X axis represents the types of implant brands such as synthes, stryker and stainless steel. Y axis represents the percentage of participants in the study. Blue colour denotes stainless steel, green colour denotes stryker and Red colour denotes synthes. Among that 60.31% were synthes branded implants, 14.95% of them used stryker brand and 24.74% used stainless steel implant branded material.

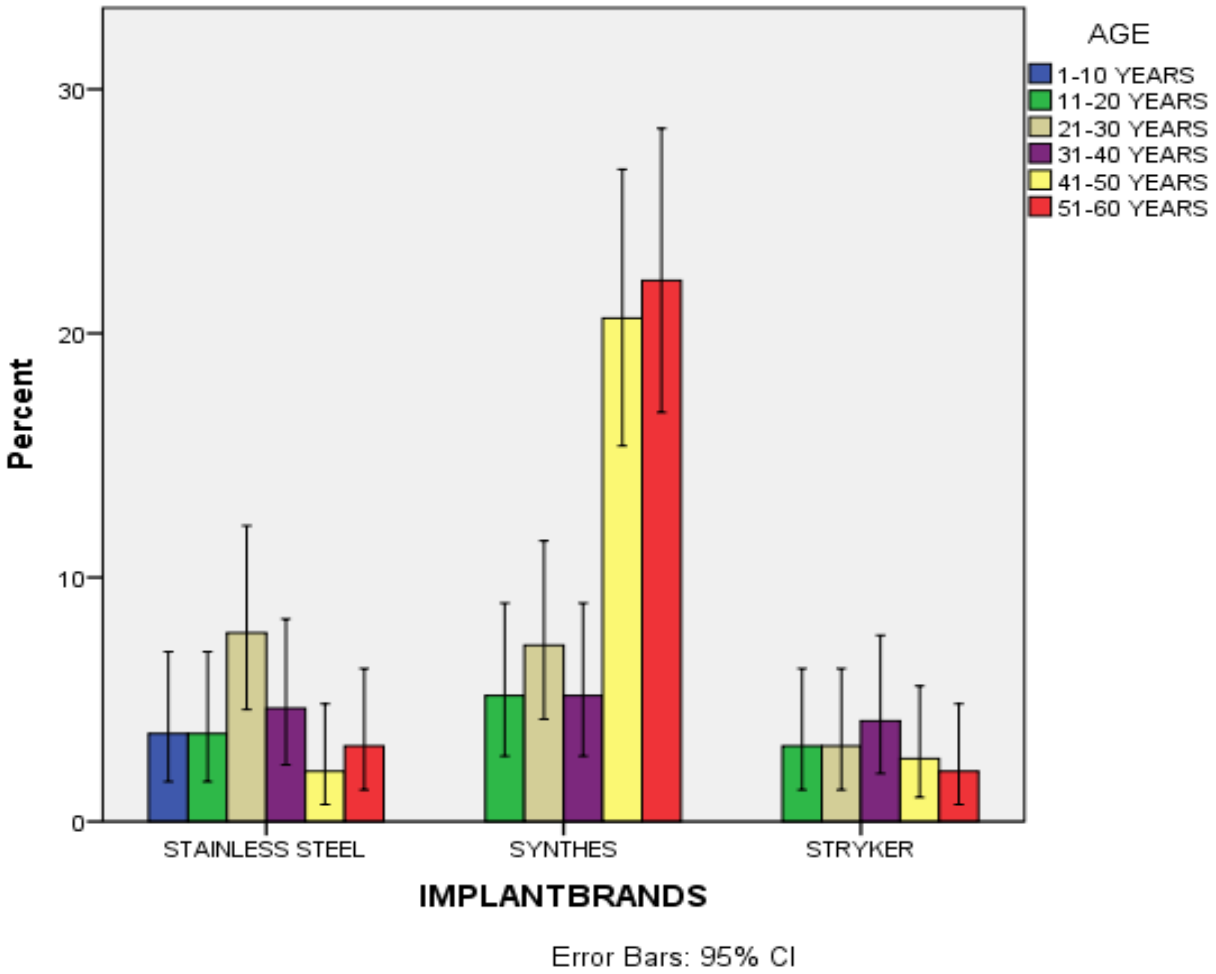

Figure 2 shows the Association between age of the participants and implant brands used for trauma management in the patients. X axis represents the implant brands used for trauma management in the patients. Y axis represents the age group distribution as 1-10 years, 11-20 years, 21-30 years, 31-40 years, 41-50 years and 61-70 years respectively. Blue colour denotes 1-10 years, green colour denotes 11-20 years, cream colour denotes 21-30 years, purple colour denotes 31-40 years, yellow colour denotes 41-50 years and red colour denotes 51-50 years. Among the 1-10 years age group, 3.61% used stainless steel alone.Among the age group of 11-20 year olds,3.61% of them used stainless steel branded implant, 5.15 % of them used synthes and 3.09% of them used strykers. Among the 21-30 years age group, 7.73% of them used stainless steel, 6.74% of them used synthes and 3.09% of them used stryker type of implant brand. Among the 31-40 years age group, 4.64% of them used stainless steel, 5.15 % of them used synthes and 4.12 % of them used stryker type of implant brand. Among the 41-50 years age group, 2.06% of them used stainless steel, 20.08 % of them used synthes and 3.09 % of them used stryker type of implant brand. Among the 51-60 years age group, 3.09 % of them used stainless steel, 22.16 % of them used synthes and 2.06 % of them used stryker type of implant brand. Collectively among all the study sample age groups, synthes was the most commonly used implant brand. Chi square test, p value =14.97 ($p>0.05$) and the results were statistically not significant.

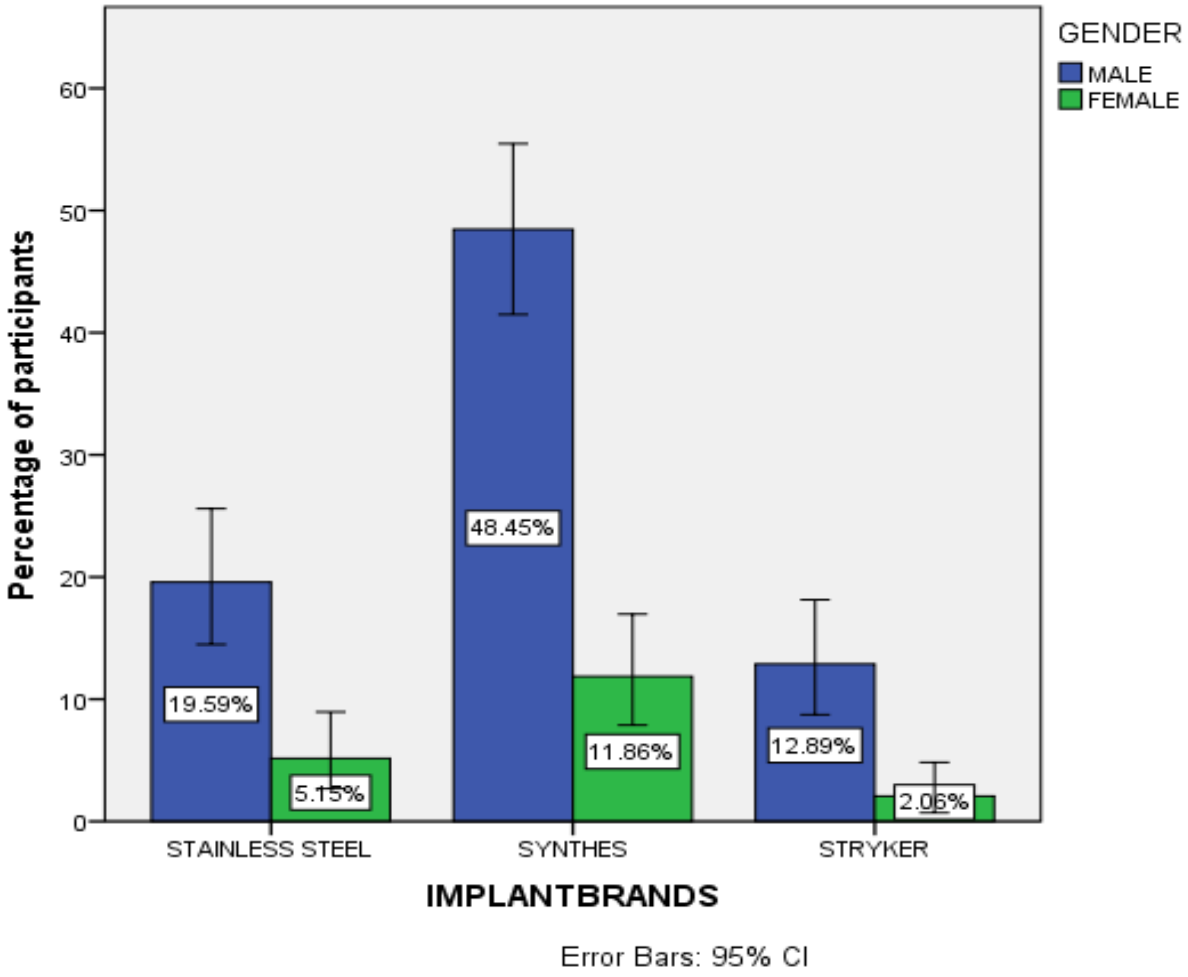

Figure 3 shows the Association between Gender and Implant brands used for trauma management in oral and maxillofacial surgery. X axis represents the Implant brands used for trauma management in oral and maxillofacial surgery and Y axis represents the gender. Blue colour denotes male and green colour denotes female. On gender comparison, synthes was the most common implant brand used by both males (48.45%) and females, (11.86%) with a higher proportion in males. p value =0.160 (p>0.05) and the results were statistically not significant.

DISCUSSION:

From the above graphs it can be analysed that,Synthes brand which is made up of titanium were most widely used implant brand for trauma management,As a result of congenital malformations, tumour resections, or trauma, large maxillofacial defects may cause functional and aesthetic difficulties. The loss of teeth causes alveolar bone resorption and remodelling, which can lead to an atrophic residual alveolar ridge. If severe soft and hard tissue injuries occur, prosthetic reconstruction attempts to recover anatomic, functional, and aesthetic functions.(39)

In the preparation and care of these patients with serious maxillofacial trauma and acquired maxillary defects, various treatment methods are often indicated. The majority of these patients will be managed to return to normal function and appearance. Only the sudden change in physiological processes associated with surgical or orthodontic treatment distinguishes them from patients with congenital maxillary defects or traumatic resection of the maxilla.(39,40)

When trauma causes significant defects in the maxillofacial region, fabrication of overdentures is preferred as both hard and soft tissue loss, and lip support can be compensated by means of acrylic resin. However, hard acrylic resin may create a problem through irritation of the fragile mucosa in the mouth after surgical operations.(39–41)(39–42)

As a treatment procedure, we applied gingival colored porcelain to compensate for soft tissue on the anterior maxilla fused to fixed zirconia prosthesis to our patients who had lost their teeth along with bone defect due to facial injury. This kind of modified prosthesis has some advantages such as stability retention and also conforms with the underlying to the hard tissues and supports soft tissues and lip as well.

A maxillofacial ballistic injury case was rehabilitated with an iliac crest bone graft, dental implants, and a low-cost acrylic resin fixed prosthesis, according to Bird and Veeranki.(43) While facial shootings trigger serious defects, they can be repaired and rehabilitated with a multidisciplinary approach, according to a three-year follow-up.They outlined the importance of and biomechanical considerations for implant positioning.(44)

Edentulism due to trauma could be properly rehabilitated by dental implant placements. Reports in the literature have adequately evidenced safe usage of dental implants after traumatic injuries. There are various considerations to plan suitable treatment options in the edentulous areas of jawbones after trauma.(45) On the first side the systemic conditions of the patient should permit dental implant surgery. Secondly the skeletal age of the patient should be adequate to implant placement as it is shown that implants do not migrate following bony development and embed in an infra-occlusion by time. (4,46)(47)

The third level of consideration is the availability of soft and hard tissues. Rehabilitation strategies are developed according to the defect size, volume, tridimensional shape of hard tissues and biotype of soft tissues. (48) Special attention is paid to preserve mucosal contours and papillae by use of flapless technique or proper incisions, as well as hard tissue augmentation options are planned taking in consideration the available vascularity, defectwall number, bone height and fixation of graft material.

In the implant placement phase the primary stability is the main target in order to initiate osseointegration. (49) There are several implant insertion techniques such as drilling, narrow drill/wider implant, osteotome, bone splint and laser-assisted which are decided based on possible primary anchorage within the residual bone.(50)

After achieving primary stability it should be decided the loading type of implants which is related to implant number, localization, length, diameter, splinting options. Basically functional immediate, non-

functional immediate, early or delayed loading protocols can be applied. Once loading protocol is fixed it should be emphasized the prosthetic supra-structure design and material.

LIMITATIONS

The study that is conducted includes a very small sample size and the outcome depends on the socio-economic status,age of the general public visiting the hospital. The skill of the professional to find the best implant brands for trauma management may also serve as a limitation if unnoticed.

The future scope of the study includes it can be used for further studies with a higher population. To create knowledge about implant brands used in the patients for their trauma management in oral and maxillofacial surgery.

CONCLUSION:

Within the limitations of the study, it can be concluded that Synthes was the most common Implant brand used in the patients for the trauma management in oral and maxillofacial surgery. Other studies that may have an alternative outcome as the result may vary depending on the hospital, the socio-economic status of the general population visiting the hospital and the number of cases that were definitely assessed. The reduced number of researches pertaining to the Implant brands used for trauma management may reduce the ability of dentists to assess the Implant brands for trauma management to treat it accordingly. The present study can be used in the future as a base to conduct another study with a larger sample size.

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CONFLICTS OF INTEREST:

The authors declare that there were no conflicts of interest in the present study.

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