



Research Article

EVALUATION OF EXTRACTION DEFECTS IN THE MAXILLARY ANTERIOR REGION BASED ON THE EDS SYSTEM: A RETROSPECTIVE STUDY

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ABSTRACT

After a tooth extraction, alveolar ridge resorption and tissue destruction is seen which may cause implant failure or compromise the ideal soft tissue esthetic.

Therefore, a proper criterion is necessary in order to classify extraction defects and recommend proper implant treatment. Therefore, the aim of this retrospective study was to identify the most common EDS classification and which maxillary anterior tooth is the most susceptible to these defects.

Methods: Three House Surgeons went through dental records (proforma) of all the patients that had visited Rajiv Gandhi College of dental science and collected data on patients who had a maxillary anterior tooth extracted and were examined and classified with the EDS system immediately after the extraction.

Results: The most common tooth that led to a defect was a maxillary canine, while the most common extraction defect in descending order is ED 1 (43%), ED 2 (30%), ED 3 (18%), and ED 4 (9%).

Conclusion: Although this classification is not as accurate and extensive as other classifications that came after it, it still stands the time and our study validates it.

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INTRODUCTION

After a tooth extraction is performed alveolar ridge resorption and tissue destruction is inevitable. (1,2) There is usually a 3 dimensional bone collapse after extraction. (3) It has been shown that there is a loss of height and width 12 months after the tooth has been extracted. However, a greater loss is seen in socket width than height. (4) Both Buccal(labial) cortical or Medullary bone loss can be seen, however the loss of buccal cortex causes the most trouble in implant success. (3)

If the bone defect is too drastic the implant may not be a viable choice and may fail or compromise the ideal soft tissue esthetic. (5) Bone resorption often prevents achieving esthetic results in the anterior maxillary region. (6) Accomplishing and preserving prime gingival esthetics surrounding anterior single implants is very difficult task. (7) Not only is functionality and success of these Osseo integrated dental implants important but also the periodontal and prosthetic burdens of the edentulous patient must be taken into consideration.

For this reason, a well-defined criterion is needed to classify the extraction defects and recommend proper implant treatment. (2,5) Many have attempted to form a classification for the alveolar defects formed after tooth extraction. (8,9,10)

However, these classifications only classify the hard and soft tissues of the edentulous site after it has healed not immediately following the extraction, which makes it difficult for clinical practitioners to decide on a course of treatment. The Extraction Defect Sounding Classification, immediately determines the state of the hard and soft tissues, tries to guess the wound healing response and offers treatment parameters in order to successfully attain proper implant Osseo integration and esthetics. (2)

Although there are many research papers evaluating the accuracy of the EDS system there seems to be a lack of papers exploring the most common EDS classification and in which maxillary anterior teeth we see the most extraction defects.

Therefore, the aim of this retrospective study was to identify the most common EDS classification and which maxillary anterior tooth is the most susceptible to these defects.

MATERIALS AND METHODS

In this cohort retrospective study, we reviewed the dental case records of patients who had a maxillary anterior tooth extracted in the Department of Oral & Maxillofacial Surgery at Sri Rajiv Gandhi College of Dental Science between March 2017 and July 2020. This was done in order to gain more

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understanding of the of the EDS classification and of the teeth most commonly affected. This was a quantitative study in which secondary data was collected.

Sampling method and criteria

Convenience sampling method was used to obtain relative data.

Sample size: 122

Inclusion criteria for the for the study group are the following

1. The extraction of maxillary anterior teeth requiring replacement.
2. Patients over 20 years of age and who are skeletally mature
3. Patients willing to be a part of the study and able to give their consent in writing.
4. ASA (American Society of Anesthesiologist) physical status 1.

Exclusion criteria for the study group are the following

1. Patients not willing to be a part of the study
2. Patients who were medically compromised including diabetes mellitus
3. Bleeding disorders
4. Patients who were smokers.
5. History of localized irradiation treatments near the extraction sites
6. Patients diagnosed with any syndromes
7. Pregnant or breastfeeding women

Tools procedure material

- Patients will be enrolled for the study consecutively as and when they report to the department.
- Pre-operative radiographs will be taken
- Only those patients who meet the inclusion and exclusion criteria will be taken into account.
- All patients will be made aware of the purpose of the study.
- After the patient has consented and the case history taken, all pertinent findings will be recorded using a pre-structured proforma by a dental intern.
- The questions included age, sex, date, marriage status, pregnancy status, any present blood disorders, any present diseases, reason for visit, and any pain present.

Armamentarium

1. Needle and syringe
 2. Anesthetic
 3. Gauze
 4. Saline
 5. Mirror
 6. Explorer
 7. Periodontal Probe
 8. Small and Large periostomes
 9. Periosteal Elevator
 10. Surgical Curette
 11. Forceps
- The extraction was done under local anesthesia using 2% Lignocaine hydrochloride with adrenaline (1:80,000) under aseptic conditions.

- The extraction socket was carefully examined using a periodontal pocket in order asses the walls and determine their classification.
- The medication given after the extraction was Amoxicillin 500 mg thrice a day for 5 days and tablet Diclofenac sodium+ Paracetamol thrice a day for three days.
- If the consumption of analgesics was necessary for less than or more than 3 days, it was recorded.

Calibration

During the examination only 2 house surgeons were allowed to determine the classification. They each checked separately, and if there were any discrepancies, then a third house surgeon checked to cast the deciding vote. This was done to decrease bias and to only allow specialized and trained professionals to determine the classification.

Three House Surgeons went through dental records (proforma) of all the patients that had visited Rajiv Gandhi College of dental science and collected data on patients who had a maxillary anterior tooth extracted and were examined and classified with the EDS system immediately after the extraction.

RESULTS

Thirty-four (28%) of the teeth extracted that led to a defect were Maxillary central incisors, while forty-two (34%) were maxillary lateral incisors, and forty-six (38%) were maxillary canines. The most common tooth that led to a defect was a maxillary canine.

The most common extraction defect in descending order is ED 1 (43%), ED 2 (30%), ED 3 (18%), and ED 4 (9%).

In Sri Rajiv Gandhi Dental College & Hospital the failure rate of conventional implants is 16/256 (6.25%) while compared to 5/60 (8.33%) in immediate implants. Chances of failure is higher in immediate implants compared to conventional implants, as it is ideal to wait 45 days after extraction.

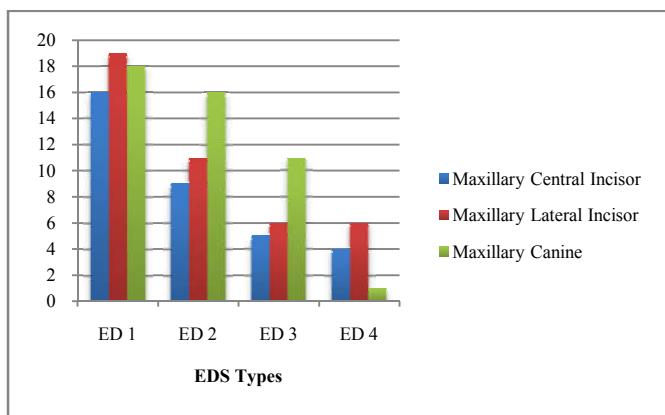
Most of the extraction sockets in the maxillary anterior region are amenable to immediate placement of implants; 53/122 (43%) can have implants straight away. However, a few may have to undergo grafting.

Table 1 The demographic characteristic of the study group

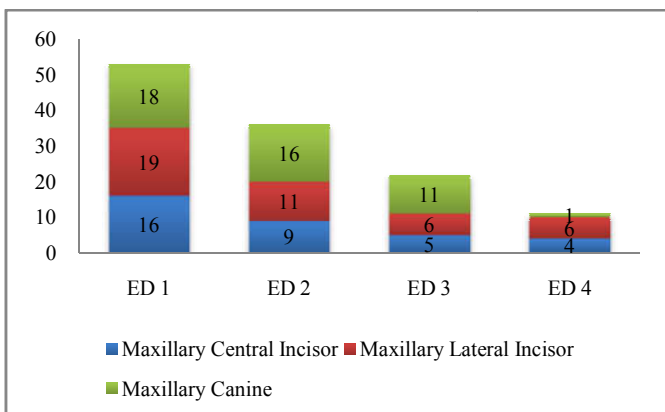
Parameter	Study group
Number of patients	122
Women	49
Men	73
Age range	23-57 years
Maxillary Central Incisor	34
Maxillary Lateral Incisor	42
Maxillary Canine	46

Table 2 Defect types and anterior maxillary teeth frequency

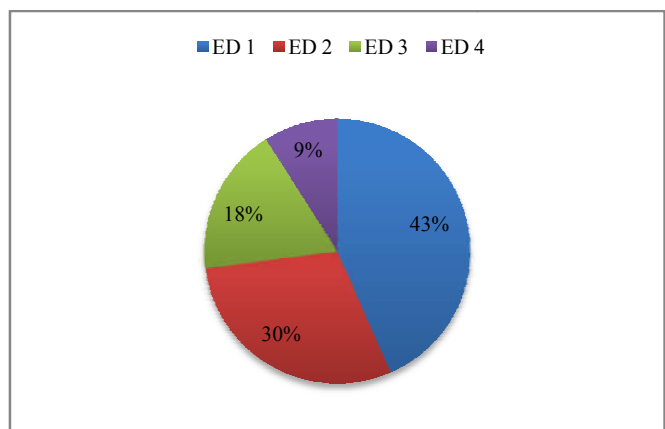
Parameters	ED 1	ED 2	ED 3	ED 4	Total Number of Teeth
Maxillary Central Incisor	16	9	5	4	34
Maxillary Lateral Incisor	19	11	6	6	42
Maxillary Canine	18	16	11	1	46
Total Number of Defects	53	36	22	11	122



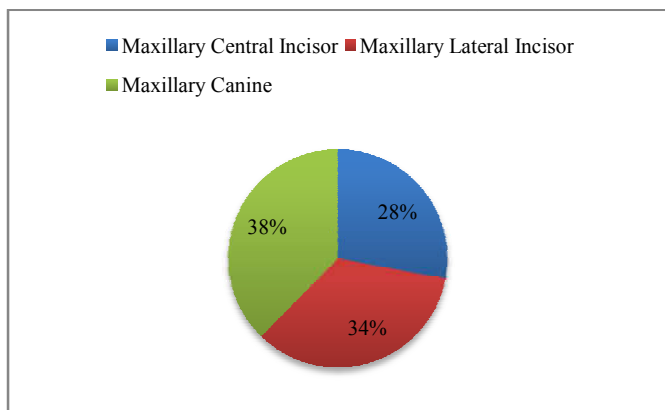
Graph 1 Defect types and anterior maxillary teeth frequency



Graph 2 Defect types and anterior maxillary teeth frequency



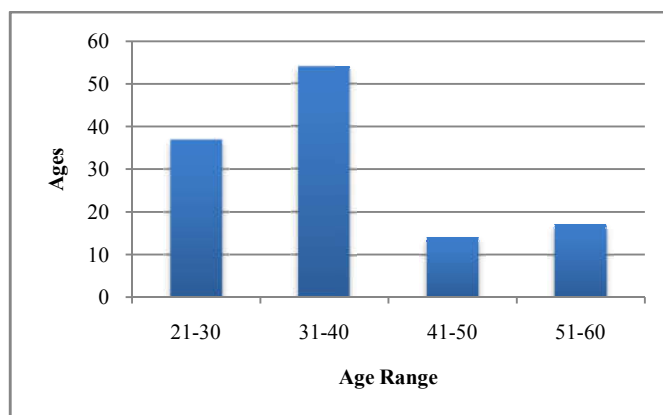
Graph 3 Total Number of Defects



Graph 4 Total Number of Affected Teeth

Table 3 Age Range

Age Range	Number of Participants
21-30	37
31-40	54
41-50	14
51-60	17



Graph 5 Age Range

DISCUSSION

In this paper our overall goal was to decipher which EDS classification is the most common after a Maxillary anterior extraction. We also wanted to determine which maxillary anterior tooth had the highest number of extraction defects. The results indicate that the ED1 classification defect was the most common after a maxillary anterior extraction and ED4 was the least common. This indicates that overall most extractions in the maxillary anterior region are not traumatic and many have a high probability of having successful implants.

It was also discovered that although the Maxillary Canine had the highest number of extractions, it had the least amount ED4 type when compared to the maxillary central and lateral incisor. ED4 is the most destructive of all the types, signifying due to either the location of the canine or its morphology the maxillary canine lends itself to be extracted with the least amount of trauma to the extraction site and therefore it should have the highest success rate with implants. However, Lin *et al* have found contradicting results in their study where they reported canines are much more susceptible to fenestrations and had a higher percentage of dehiscence when compared to central and lateral incisors. (11)

These results were expected. As stated previously, the failure rate of conventional implants at Sri Rajiv Gandhi Dental College & Hospital is 16/256 (6.25%) while compared to 5/60 (8.33%) in immediate implants. Chances of failure is higher in immediate implants compared to conventional implants. In this study the total number of ED4 classification type was 11 out of 122 (9.1%), which is very similar to the 5/60 (8.33%) indicating that usually those with an ED4 classification are much more likely to have an unsuccessful implant.

Immediate implants are becoming more and more popular due to a high percentage of clinical success. However, successful implants are only possible when the implant site is carefully chosen. (12-14) Many extraction sites have bone defects that can affect both the functional and esthetic outcome of maxillary anterior tooth implants. (6) Juodzbaly *et al* demonstrated in their study that when careful evaluation of

potential extraction sites are done there can be a 100% success rate in the implant survival after 1 year.(15) Sulugodu *et al.* also demonstrated this with a 100% implant success rate in extraction sites that had no loss of labial bony plate or perforations.(16) A 100% success rate can also be attained through proper site preparation and guided bone regeneration. There was a 100% implant success rate when GBR was used in implant sites with facial osseous-defects. (17)

In order to obtain the ideal functional and esthetic results during an immediate implant procedure a classification is needed to guide the clinician. Caplanis *et al* was the first to present a classification for the extraction defect and its treatment plan recommendation (EDS system). Caplanis *et al.* assess the extraction site by the number of socket walls affected, biotype, hard tissue, distance to reference, ideal soft tissue, and provides treatment recommendations. Many previous studies have used one or multiple of this studies assessment to determine the success of the implant surgery. (2) Kan *et al* determined that peri implant mucosal dimensions were greater when the peri-implant biotype was thick rather than thin. (7) Hoffmann *et al* evaluated the regeneration of extraction sockets after using dPTFE a high-density polytetrafluoroethylene membrane. He determined that there was notable socket volume regeneration and it was able to preserve hard and soft tissue. (1) Lekovic *et al* also experimented with alveolar ridge maintenance using ePTFE after a tooth extraction. The study reported improved bone quality that is beneficial for dental implants. (4)

However, it wasn't a complete and accurate classification according to Juodzbalys *et.* It lacked the assessment of keratinized gingiva width, soft tissue quality parameters, implant palatal angulation, height of alveolar process, available bone beyond the apex of the extraction socket, and soft tissue contour variations. Juodzbalys *et al.* offered a new classification that compensated for the previous classification. Their results were very promising with 80% of the cases that followed the treatment protocol attaining a type I grade esthetic.(18) Lin *et al* has also stated that if an immediate implant is to be done without flap elevation, a CBCT scan is absolutely imperative in order to examine the angulation of the tooth and the alveolar ridge proving that a simple examination that Caplanis *et al* explains is simply not enough(11) Many other extraction socket classifications have been made including Elian *et al* in which their classification assessed the mid-facial recession associated with labial bone loss. Three types were classified. (19) Later Chu *et al* added a sub classification for the Type 2 Sockets. (20) Tolstunov created a classification specifically for the alveolar ridge width along with treatment considerations.(3)

One of the main limitations of this study is the bias of the House Surgeons when determining the EDs classification type. Both examined the patient separately and had a third house surgeon give his opinion if there was a contradiction. Although, this greatly decreased the chance of bias, there still is a much higher chance than if only one house surgeon was assessing the extraction site. Another limitation in this study is the lack of photographs taken during the examination of the extraction site. If photographs were taken at the moment of extraction, they would provide concrete evidence that researchers could look back at and maybe rectify the EDS classification.

Although the classification system in the Juodzbalys *et al* study and Lin *et al*'s suggestion to use CBCTs for immediate implant surgery is more accurate and thorough, it is incredibly time consuming and expensive. The EDS classification is simple and fiscally more reasonable for the average dentist. Further research is required to establish which classification produces the most positive results and can plausibly be done in a clinical setting.

CONCLUSION

Functionally and esthetically successful implants are completely dependent upon the bone health and periodontal biotype. Due to the traumatic nature of tooth extractions there is bound to be alterations in the alveolar ridge. The EDS system is a valuable tool for immediate implant determination. It is objective, accurate, simple, quick, and inexpensive. Although this classification is not as accurate and extensive as other classifications that came after it, it still stands the time and our study validates it.

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