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THE FREQUENCY OF PRE-ORTHODONTIC SURGERIES: A PROSPECTIVE STUDY OF 191 PATIENTS

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ABSTRACT:

Objective: To establish the frequency of surgical procedures requested by orthodontists.

Materials and methods: A prospective study of 191 patients requiring 306 surgeries was conducted in private clinics in the cities of Benghazi and Almarj in the eastern part of Libya.

Results: All the 191 patients included in this study were Libyans. There were 150 female and 41 male patients, and the female to male ratio was 3.6:1. The types of operations performed included the following: 234 (76.4%) surgical impaction extractions; 60 (19.6%) surgical impaction exposures, including 40 canines, 13 incisors, and 7 premolars; 4 (1.3%) upper labial frenectomies; 1 (0.32) lingual frenotomy; and 7 (2.28%) surgically-assisted rapid palatal expansions.

Conclusion: The necessity of pre-orthodontic surgeries requires more research, as there is disagreement among authors concerning if and when surgeries should be utilized, especially regarding removing or retaining the impacted teeth.

Key words: Impacted, Maxillary, Expansion, Frenectomy, Surgical, Exposure, Preorthodontic.

INTRODUCTION:

Minor oral surgery affecting either the teeth or soft tissues is performed to partially prepare the patient for subsequent orthodontic therapy.[1] In a study conducted in Romania, about a quarter of 587 patients required pre-orthodontic surgeries before orthodontic treatment, and the authors concluded that substitution of surgical-orthodontic treatments with only orthodontic treatments might cause post-treatment recurrence of malocclusions. [1]

The need for surgery before orthodontic treatment has been well reported in the literature. Impacted teeth, supernumerary teeth, odontomes, abnormal frenal attachment, and maxillary transverse deficiency are issues requiring surgical management before orthodontic treatment, with tooth impaction being the most common pre-orthodontic problem.[1-11]

The surgical removal of impacted or supernumerary teeth and odontomes, the surgical exposure of impacted teeth with or without traction, frenectomies, and surgically assisted rapid palatal expansion are all discussed in the literature to solve the problems mentioned above.(1-11)

In the literature, these problems and their solutions are discussed separately, and only a few articles considered all pre-orthodontic surgeries together(1). Therefore, this study aims to establish the

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frequency of surgical procedures performed to facilitate orthodontic treatment.

MATERIALS AND METHODS:

A three year prospective study of 191 patients requiring 306 surgeries was conducted in private clinics receiving referrals from more than 5 orthodontists in the cities of Benghazi and Almarj in the eastern part of Libya. All the patients were operated by the same surgeon, who has 12 years of experience in the field of oral and maxillofacial surgery.

Simple orthodontic extraction was excluded from the study because we focused on surgical procedures that started with incision and ended with sutures. The procedures included were as follows: the surgical removal of impacted teeth, supernumerary teeth and odontomes; the surgical exposure of impacted teeth; frenectomy; and surgically assisted rapid maxillary expansion.

Surgical settings were the same among all the patients. The operations were performed under either local (LA) or general anaesthesia (GA), and a number 15 blade was used for all the incisions. Single interrupted sutures or blanket sutures were used for closing the incision, and 3/0 polygalactin and 3/0 black braided silk were used as suture materials.

In the postoperative period, the medications used were the analgesics and anti-inflammatory agents ketoprofen or diclofenac potassium and the antibiotics augmentin or cephalexin.

For the localization of the impacted teeth, intraoral periapical films (IOPAs), orthopantomographs (OPGs), and tube shift techniques were used.

The parameters we obtained were demographic data (age, gender, nationality, medical history, type of surgery), anatomic data (body mass index, gag reflex, mouth opening), and operative data (time, technique, anaesthesia, flaps, suturing). Operative and postoperative complications were also assessed.

RESULTS:

All 191 patients included in this study were Libyans. There were 150 females and 41 males, with a female to male ratio of 3.6:1. Their ages ranged from 7-44 years; the age group 0-10 had 11 patients, age group 11-20 had 88 patients, which was the highest number of patients, age group 21-30 had 82 patients, and age group 31-40 had 10 patients.

The majority of our patients did not have previous illness or surgeries, except for 3 patients with a history of appendicectomy, tonsillectomy, and cleft lip repair. Two patients were asthmatic, one patient had succinyl-choline apnea, and the oldest patient had diabetes.

The types of operations performed included the following: 234 (76.4%) surgical impaction extractions, 60 (19.6%) surgical impaction exposures, including

40 canines, 13 incisors, and 7 premolars; 4 (1.3%) upper labial frenectomies; 1 (0.32) lingual frenotomy; and 7 (2.28%) surgically-assisted rapid palatal expansions.

Surgically extracted impacted teeth included 160 (68.38%) wisdom teeth, 36 (15.38%) canines, 15 (6.41%), supernumerary teeth, including 7 mesiodenses, 13 (5.55%) premolars, 4 (1.7%) odontomes, 2 (0.85%) incisors, 2 (0.85%) remaining roots, and 2 (0.85%) deciduous teeth.

The body mass index (BMI) in the study group ranged from 16 to 32.8. All the patients have a mouth opening of more than 3 fingers in length, and no gagging observed during the operation. Thirty-five operations required 15-30 minutes to be finished. The operation time was more than 30 minutes in surgeries performed for two cases of buttress release, one mesiodens extraction, one impacted premolar, and two impacted canines; the rest of the operations required less than 15 minutes.

Elevation only as a surgical technique was employed in 7 patients, three with supernumerary teeth and four with impacted wisdom teeth. An osteotomy was performed in 242 operations, while osteotomy with sectioning was performed in 52 operations, and the remaining operations were frenectomies.

Two patients were operated under GA for impacted teeth; the rest of the patients were operated under LA using either infiltration or blocks. The envelope flap was used in 216 operations, and the other types of flaps included 37 trapezoidal flaps, 41 triangular flaps, 7 Lefort I sulcular flaps for buttress release; the rest of the procedures were frenectomies and the one frenotomy.

For the cases of buttress release, sutures were placed using blanket technique, whereas in the other surgeries, we employed interrupted sutures. Intraoperative complications included 3 cases of crown fracture of the wisdom teeth, 4 cases of envelope flap tearing, and 1 case of epistaxis, which occurred in the buttress release case. This last case had a previous history of cleft lip and palate operation.

Postoperative complications included pain, numbness, infection, wound dehiscence, swelling, ecchymosis, and limited mouth opening. Postoperative nasal bleeding was noted by one patient who was treated for high impacted canines.

DISCUSSION:

The current literature lacks information regarding the incidence, prevalence, and frequency of pre-orthodontic surgeries. G. Zegan et al.[1] studied the frequency of some minor oral surgeries performed on both teeth and soft tissues prior to orthodontic treatment in 587 patients and reported that 24% required minor oral surgeries before orthodontic treatment. In our report, it was difficult to estimate the percentage of patients requiring surgeries before treatment of

malocclusion because we received referrals from different private clinics.

Among the 191 patients in the current study, 150 patients were female and 41 were male, and there was a female to male ratio of 3.6:1. Consistent with previous reports, [1] there were more female patients than male patients, especially in the 11-20 age group. In our opinion, this is because females are more concerned about aesthetics than males, and in this age group, both patients and parents started recognizing the need for orthodontic treatment.

The most common surgery performed before orthodontic treatment in our study was the removal of impacted teeth (76.4%), followed by the surgical exposure of impacted teeth (19.6%). This approximates the results reported by G. Zegan et al. (1) if we exclude the serial and orthodontic extraction.

It is reported that 16.7% to 68.6% of third molars remain impacted (1,12); 65% of 600 orthodontists and 700 oral surgeons agreed that, sometimes, the third molars produce crowding of the anterior mandibular arch. If the wisdom teeth do not have enough space to erupt, their removal is indicated after the eruption of the second molars for creating space in the posterior dental arches,[1]

Canines are the most commonly impacted teeth after the third molars; [2,5,8,] impacted canines registered a frequency of 0.8% to 2.8%.[1,9,12] Most of the cases were in a palatal position with a palatal-labial ratio of 2:1.[5] Potential problems associated with impacted cuspids, such as resorption of the adjacent roots, referred pain, infection, dentigerous cyst formation, which may lead to ameloblastoma, and resorption of the affected tooth, require management of theses teeth.(5). As previously reported, only the teeth with favourable positions were exposed to orthodontic traction. Impacted canines with abnormal positions obstructing the orthodontic movement were extracted surgically.[1]

Impacted maxillary incisors can have a significant impact on patients' aesthetic and social behavior; the incidence of unerupted maxillary central incisors have been reported as ranging from 0.13% (4) to 2.6%.(12) In the present study, the frequency of impacted incisors, including both upper and lower, was 5.1% (15 incisors out of 294 impacted teeth). Only two incisors were removed because it was challenging to bring them into the arch; the other impacted incisors were exposed for orthodontic traction.

The removal of supernumerary teeth should be performed as soon as possible to avoid complications such as regional dental crowding, root resorption of the adjacent permanent teeth, and impaction. [1,10] Such complications can be avoided by early detection and management of these extra teeth.[1] The mesiodens is the most commonly occurring supernumerary tooth. The presence of this tooth may cause midline diastema, rotation of incisors, ectopic eruption, impaction of incisors.[10] Impacted incisors due to supernumerary

teeth have a better prognosis than incisors that fail to erupt due to other causes.[4]

Odontomes occur more often in the permanent dentition and are rarely associated with the primary dentition. One third to one-half of odontomes prevent the eruption of teeth. Generally, odontomes account for 65% of all the odontogenic tumours.[4] The best treatment option for odontomes is surgical removal, which has a low recurrence rate.[11] In the present study, only 4 patients with odontomes were found, representing a low percentage of the total patients considered in this study; all odontomes were treated by surgical removal.

Surgical exposure of impacted teeth accounted for 19.6% of the operations in this present study. Minimal approache was used for the exposure of impacted teeth, including the creation of a small window or an apically repositioned flap and the closed eruption technique, which are surgical methods reported in the literature for this purpose.[4] In this study, to expose the impacted teeth, we used the closed eruption technique, in which a flap was raised, the impacted tooth was exposed, and orthodontic traction was applied; then, the flap was replaced and sutured. It is mentioned in the literature that the closed technique resulted in more aesthetically pleasing gingiva than the apically repositioned flap [4].

Intraoral periapical films (IOPAs), orthopantomographs (OPGs), and the tube shift technique were the tools used for localization of the impacted teeth. Cone beam computerized tomography (CBCT) was used in very few cases because it is expensive and not readily available.

In our report, soft tissue procedures were limited to 4 labial frenectomies to correct midline diastema and one lingual frenotomy. Those surgeries were low in frequency compared to other hard tissue procedures; this is consistent with the study of G. Zegan et al.[1] in which they report the low incidence of midline diastema and that some diastemas are due to midline pathological causes.[3]

Midline diastema may be temporary and usually closes after the eruption of canines; no treatment should be initiated if space is physiological. However, treatment of midline diastema is necessary to avoid problems related to high frenal attachment, such as cosmetic and phonetic deficiencies, and problems related to oral hygiene and periodontal health.[3] A labial frenectomy can be performed before, during, or after the orthodontic closure of the maxillary midline diastema, depending on the individual case.[13] On the other hand, some authors recommend closure of diastema before surgery because a scar formation can impede the closure of the diastema.[3]

An orthopaedic maxillary expansion is used to solve the problem of crossbite; however, this is effective only when the interpalatine suture is still patent.[6] In a

mature patient where the suture had synostosed, the orthopaedic maxillary expansion will lead to teeth tipping, extrusion, periodontal membrane compression, buccal root resorption, alveolar bone bending, fenestration of buccal cortex, palatal tissue necrosis, pain and instability of the expansion. Due to the problems related to orthopaedic expansion, surgically assisted rapid maxillary expansion has been recommended. [6,7]

The literature recommends the consideration of age, sex and medical conditions as criteria for selection of orthopaedic or surgically assisted expansion. The exact age after which the surgery is mandatory is debatable; some authors recommend 12 years and others recommend 25 years of age to start the surgically assisted expansion. The medical conditions, such as metabolic and bone diseases, can affect the flexibility of facial skeleton, rendering the expansion more difficult (7). Michael and John reported that a cemented palatal expansion appliance could be used successfully in adults up to 43 years of age and could be augmented with lateral maxillary osteotomy in older patients. Lehman, Hass, and Hass also mention that an "osteotomy of the zygomaticomaxillary buttresses in combination with a rapid palatal expansion appliance is a dependable treatment for horizontal maxillary deficiency in adults. This procedure was successful in 17 patients out of 18 patients. In one patient, the treatment was discontinued because pressure necrosis of palate related to the appliance". [14]

One male and 6 females who were healthy and within the ages range of 18 to 28 were our candidates for surgically assisted expansion. We only performed osteotomy at the areas of maximum resistance to lateral movement to assist maxillary expansion; the osteotomy extended from the piriform aperture to behind the zygomatic buttress without performing a midpalatal split. This approach can be justified by some reports that have shown midpalatal suture does not offer much resistance to expansion. The areas of resistance to lateral expansion have been classified as the anterior support (piriform aperture pillars), lateral support (zygomatic buttresses), posterior support (pterygoid junctions), and median support (midpalatal synostosed suture).[7]

CONCLUSION:

The necessity for pre-orthodontic surgeries requires more research, as there is disagreement among authors concerning if and when surgeries should be utilized, especially regarding removing or retaining the impacted teeth.

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