

Maxillary Tuberosity Fracture as a Post-Operative Complication - Case study

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Abstract

A maxillary tuberosity fracture is a rare complication which poses a serious surgical and prosthetic problem. The fracture is observed during extraction as the whole tuberosity is shifted together with forceps and the tooth. With regard to the size of the fractured bone fragment three degrees of fracture can be distinguished: mild fracture, moderate fracture and severe fracture.

Maxillary tuberosity fracture can seriously affect both the complete and partial dentures because it disturbs the static of the prosthetic work, but it is equally important in terms of forensic medicine wherein it is considered as grave body injury.

The aim of this paper is to present a case of maxillary tuberosity fracture from our own dental practice and report on the diagnostic-therapeutic protocol we applied. The paper is also focused on ways to prevent the emergence of tuberosity fracture in everyday practice of a general dental practitioner.

This paper presents a case of the maxillary tuberosity fracture from our dental practice. The diagnostic and therapeutic protocol has been described in detail with a particular emphasis on the application of routine sutures as a means of immobilization. Three months after the fracture the extraction was carried out surgically without damaging the tuberosity. It was our primary objective and the desired outcome for the patient.

In the final paragraph of the present paper we present a set of conclusions in regard of maxillary tuberosity fracture as a potential complication during the extraction of maxillary molars. It is possible to prevent such a complication if a dentist exercises high caution. Once the fracture has occurred it is

necessary to consider all immobilization options in order to enable its healing. If a fracture occurs, the patient should be immediately informed, given first aid and referred to a specialist unit.

Key words: tuberosity fracture, complication, immobilization

1. Introduction

Maxillary tuberosity fracture is a rare complication which poses a serious surgical and prosthetic problem. The tuberosity fracture may occur due to inadequate application of elevator (luxation of the wisdom tooth distally), deep thrust of forceps and utilization of rough force, extraction of the isolated upper molars with the pneumatized alveolar process (second and third molar), but also during the extraction of impacted teeth, and in cases of ankylosis of a first and second molar with the bone, anomalies of roots of the upper molars, in gemination, concrescence, multiple traumas of the face and jaws etc.

Diagnosis of tuberosity fracture. The tuberosity fracture can be observed during the extraction as the whole tuberosity is shifted together with forceps and the tooth. The diagnosis is made on the basis of clinical examination and x-ray film. The deformity can be observed on further inspection. The fracture line can be palpated from the buccal or palatal side, but it is also seen on the x-ray film. The soft tissue can be lacerated. Also, due to the injury of blood vessels, the emergence of haematoma on the palatal side is also possible. Ordinarily, in case of tuberosity fracture the sinus is opened so that all signs common for this specific complication are also noticeable.

With regard to the size of the fractured bone fragment three degrees of fracture can be distinguished:

1. Mild/small tuberosity fracture (along the extracted molar a small portion of the adherent bone fragment of the tuberosity adjacent to the root is attached).
2. Moderate/medium tuberosity fracture (along the extracted molar a greater part of the adherent tuberosity is attached, covering the area adjacent to the root, but also wider).
3. Severe/ catastrophic tuberosity fracture (the fracture line entails a great part of the tuberosity and the adjacent tissue pterygoid plate, blood vessels and muscles) (1).

The serious complications resulting from the maxillary tuberosity fracture have been reported earlier. In his book 'Dental Extraction' Coleman cited Cattlin's work dating from 1858 where a case of the maxillary tuberosity fracture was reported, resulting in deafness due to the disruption of the pterygoid hamulus and m.tensor veli palatini muscle, and this in turn damaged the Eustachian tube. As a result, the patient was left with a permanent reduction of mandibular movements caused by the injury of the pterygoid muscle and ligaments (2). Dissections of cadaver skulls at the Guy Campus Medical School in London have shown that the structure of bones and muscle attachments in the area of the maxillary tuberosity and lateral pterygoid plate can vary greatly. The examination of cases of grave fracture have shown the distance between the maxillary tuberosity and the initial part of the lateral pterygoid plate to be relatively small which is a predisposing factor for a comprehensive fracture in such cases (3).

The important consequences of maxillary tuberosity fracture are as follows:

1. *Prosthetic*: The loss of tuberosity has a number of undesirable consequences in respect of prosthetic works: the foundation of the complete denture is disturbed; because of the impossibility of extension of the free saddle of partial denture, the pressure on the remaining integument is increased which, under certain conditions, can cause the pathological impact of the denture on the supporting tissue. In either case the static of the prosthetic work is disturbed.

2. *Forensic*: Maxillary tuberosity fracture is considered a serious body injury. From the viewpoint of forensic medicine the process of assessing incapacity percentage varies, depending on skeletal deformities and a degree of dysfunction. In the case of tuberosity fracture the degree of incapacity is assessed in the range of 10 to 30% with a gradual 1% increase with each lost tooth, and 1, 5% for the first permanent molar (4).

Tuberosity fracture is treated on a case to case basis because in the overall therapeutic procedure several factors must be taken into consideration such as age and general health condition of a patient, a toothache prior to extraction, whether the sinus was open or not, and also the overall condition of the remaining alveolar process, a degree of the fractured bone, the presence of antagonists etc.

In general, three treatment procedures are applied:

1. Surgical removal of the tooth and fractured tuberosity.
2. Surgical extraction of the tooth by careful detachment from the bone.
3. Immobilization and fixation of the fractured tuberosity together with the bone.

2. Aim

The aim of the present paper is to report a case of the maxillary tuberosity fracture from our dental practice with a review of the diagnostic-therapeutic protocol and a set of recommendations to prevent its occurrence in everyday practice of a general dental practitioner.

3. Case report

3.1 First visit

The patient came to the Dental Surgery Clinic of the Faculty of Dental Medicine to have the tooth No 27 extracted. During medical examination we learned that the said patient did not succeed in having the tooth extracted in a local dental surgery. Thereafter the patient brought an independent de-

cision to contact the Oral surgery Clinic of the Faculty of Dental Medicine. Following the extraoral examination a haematoma with the two-centimeter diameter in the area of the lower edge of the mandible without any other specific features was observed (Figure 1). The haematoma could be accounted for by the attempted tooth extraction undertaken by the general dental practitioner from the local dental surgery who had failed to complete the extraction. A close intraoral examination enabled us to observe a significant asymmetry of the upper left quadrant in relation to the right one in a sense of the enlarged palatal alveolar ridge, while no changes in the vestibular part could be observed. The mucosa in the tuberosity area was of a slightly changed colour, free of disruption, and of soft consistence on palpation (in a sense of haematoma or oedema). No x-ray film had been made.



Figure 1. Haematoma of the left cheek.

Tentative diagnosis: On the basis of clinical examination under local anaesthesia the following diagnosis was made:

Dg: Status post tentaminem extractionis dentis 27 cum fractura tuberis maxillae suspecta.

With regard to the patient's allegation of bleeding from the left nostril there was also a suspicion of:

*Haematosinus l. sin
and
Haemathoma buccae l. sin.*

Therapy: The sutures were placed over the tooth No. 27 in order to immobilize it (Figure 2), a panoramic radiogram (Panorex) and the retro alveolar x-ray of the 25-27 area and also the x-ray of the para nasal sinuses were indicated as necessary. Ampicillin antibiotic in the 500mg dosage (4x2) was administered. Cold compression wraps were recommended and an analgesic if necessary, along with C vitamin tablets (2x1) and soft food.

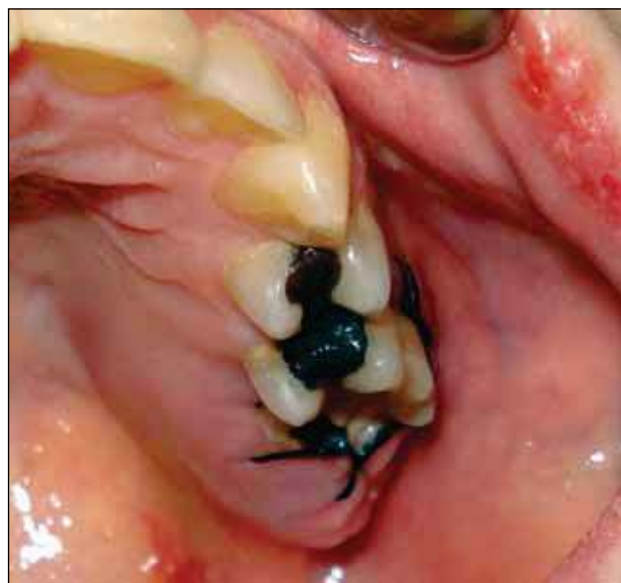


Figure 2. Immobilization of tuberosity fracture with sutures

3.2 First check-up

The first check-up was arranged two days after the first visit. The patient complained of shivering and feeling faint, but not of the loss of appetite. The haematoma on the cheek had receded. The patient did not complain of nose bleeding. The Panorex showed a fracture line in the maxillary tuberosity area mesially from the tooth No 27 (Figure 3). On the PNS (para nasal sinuses) x-ray film the obscuration of the left maxillary sinus was visible confirming our suspicion of haematosinus (Figure 4). The retroalveolar x-ray film showed the existence of the fracture line.

Definitive diagnosis: The analysis of the Panorex, PNS and retroalveolar x-ray films has confirmed our tentative diagnosis.

Therapy: After consulting the maxillofacial surgeon regarding the maxillary tuberosity fracture it was decided to postpone the extraction of

27 tooth until the formation of the bone callus. It was also decided to continue with the prescribed therapy and regular check-ups prior to the surgical extraction of the tooth.



Figure 3. Enlarged detail from the Panorex film where the fracture line can be observed.



Figure 4. X-ray film of paranasal sinuses with the visible obscuration of the left sinus.

3.3 Further check-ups

Further check-ups confirmed the regression of symptoms. The sutures were removed ten days after their placement while the antibiotic therapy was administered for ten days.

3.4 Check-up after one month

After one month a control PNP X-ray was made which showed the normal transparency of both maxillary sinuses confirming the complete regression of the haematoma (Figure 5). On the control Panorex film no significant differences could be observed in relation to the Panorex film made on the day of fracture. On examination an insignificant pathological moveability of the tuberosity was established. The patient was referred to come for a control check-up in three months' time following the day of fracture.



Figure 5. Paranasal sinuses x-ray film one month later with the observable transparency of both maxillary sinuses.

3.5 Surgical extraction of tooth three months after fracture

Three months after the tuberosity fracture a decision was made to extract the teeth No 27 and 25 surgically in accordance with the following procedures:

Under local anaesthesia incision was made following Peter Nowak's procedure, and the mucoperiosteal flap was raised. By applying a sharp fissure borer the roots of the second upper left maxillary molar were separated, and each of them was extracted separately with tender rotating extraction movements (Figure 6). In a trauma-free

manner, and with prior minimal corticotomy the second upper premolar was extracted. After treating the edges of the extraction wounds by flame shape carbide burr, the mucoperiosteal flap was lowered, adjusted to the deficiency and stitched up.



Figure 6. Separation of roots of the second molar

4. Discussion

A maxillary tuberosity is thought to be more predisposed to fracture if the maxillary sinus has enlarged between the teeth and into tuberosity so creating thin bony walls in the dentoalveolar system. Dental anomalies of the maxillary molars may also be contributory including tooth fusion, tooth isolation, ankylosis, hypercementosis, chronic periapical infection and roots which are widely divergent. If a big risk of fracture during extraction is thought, surgical extraction of teeth is strongly recommended (5,6,7).

In the retrospective analysis on the sample of 1213 patients, Christiaens et al. report that the incidence of complications in the upper jaw during extraction of third molars under local anaesthesia is 1,5% , while under general anaesthesia it is 2%. The most common complications in the upper jaw are tuberosity fracture and the creation of oro-antral communication. Understandably, the complications were more common in cases when the dental surgeon had less experience, the patient was older and the tooth was set deeper in its foundation (8).

All the predisposing factors contributing to tuberosity fracture have been reported in the literature, but dental malpractice has not been mentioned too often. In reporting their case Hidayet et al. refer to this particular problem. They report a careless and sloppy work on part of dentists. From the medical card they learned that the dentist did not fix the alveolar ridge in the area of the molar which was extracted. Besides, the general dental practitioner applied great thrust without fixing the ridge and, as a result, he had trouble to extract the tooth (9).

At this point we would like to draw a comparison with the abovementioned case study and assert that in our case carelessness was also one of the etiological factors since the morphological features contributing to the maxillary tuberosity fracture were not observed by the general dental practitioner in the local surgery. On top of this, the patient was sent home without any explanation as to the nature of the complication or referral to a specialist. Our case has proved that the maxillary tuberosity fracture resulting in the enlargement of the maxillary sinus can also occur in younger patients with the relatively well preserved teeth. This in turn justifies our claim that the ensuing complication was caused by the rough and careless work of the general dental practitioner. Complications in everyday dental practice are a common occurrence, but the duty of a practising dental practitioner is to recognize them and provide a clear and precise explanation to the patient. Resolving basic complications in oral surgery practice is the remit of every general dental practitioner and if he/she disposes of the necessary material his/her duty is to give first aid to a patient and refer him to a specialist unit. In our case, we had to address the emerged complication. We believe that the careful assessment of the gravity of extraction and potential complications is of inestimable importance for a successful intervention. Careful separation of roots, being in the remit of a general dental practitioner, is vital for a successful completion of "difficult extractions", and, more importantly, it is a way to prevent serious complications such as maxillary tuberosity fracture.

Maxillary tuberosity fracture does not only occur during extraction of second and third molars but also of the upper first molar according to available literature. Fixation of the alveolar ridge

is certainly a recommended procedure. In case of complications resulting from routine dental interventions a patient must be referred to a specialist. The application of simple fixation techniques reduces further progression, serious complications and the patient's trouble, enhancing at the same time the healing process (9).

In our case the tuberosity fracture could not be observed in the first routine examination. Only after the application of forceps on the tooth No 27 did it become clear that at the attempted luxation toward the vestibule the whole maxillary tuberosity was being shifted with plenty of dark blood oozing from the maxillary sinus. Furthermore, it also became clear that the continuation of extraction would lead to the damage of the whole tuberosity. The greatest dilemma we were faced with was whether and in what manner to perform immobilization. The decision to perform immobilization in the simplest possible manner by applying sutures proved in the long run to be most effective since it enabled the healing of the tuberosity and prevention of invalidity.

The fracture of a great portion of the bone in the maxillary tuberosity area is a condition of exceptional gravity. The big fractures of maxillary tuberosity present great complications. The major therapeutic objective is to save the fractured bone in situ and create the best possible conditions for its healing (10).

The surgical extraction of the tooth and the tuberosity must be performed when the tooth had ached prior to extraction and when there is no possibility for the tuberosity to tether with the tissue of the upper jaw. If the fractured part of the tuberosity is smaller, or if the tooth was symptomatic in the moment of fracture, most authors consider that it must not be left in situ, the only solution being the removal of the tooth along with a part of the tuberosity (6, 11). If the alveolar segment is avulsed and detached from the mucoperiosteal lobe, there is a great likelihood it will not heal if left untreated. All tuberosity fractures do not necessarily fall under this category. The avulsed bone must be slowly released from the remaining soft tissue with periosteal elevator. A big oro-antral fistula is inevitable in this situation. However, in view of a loss of the supporting bony substance, ordinarily there remains enough of the soft tissue to enable its normal closure (12).

If it is thought that there is a possibility of tethering of the tuberosity to the bone, the tooth should carefully be extracted by separating its roots or both its crown and roots, simultaneously fixing the tuberosity with wire ligatures or splint. Ngeow defends the conservative approach in big maxillary tuberosity fractures presenting an alternative method whereby a tooth is firmly gripped with molar forceps, resulting in the stabilisation of the fractured segment, and after that, by using Coupland periosteal elevator the alveolar bone is separated from the roots of the tooth, thus reducing a further progression of the fracture line (13).

If a tooth was not painful but the patient came for routine treatment but, nevertheless, there occurs the maxillary tuberosity fracture the immobilisation and fixation of both the tooth and tuberosity should be performed.

Clinical dental surgeons should inform a patient of potential complications and advantages of various treatment procedures before a final decision on treatment is reached. The experience of Hidayet and his associates is that an attempt should be made to save the big fractures, but on the other hand, immediate removal of the small particles of tuberosity around one or two teeth is a better choice in case of small fractures due to difficulties with regard to saving the bone. (9).

The routine treatment of a big tuberosity fracture involves the stabilisation of the mobile portions of the bone by the application of rigid fixation techniques in the duration of 4-6 weeks. The surgical extraction may be attempted once the healing process has successfully been completed. If a tooth is infected and the symptoms of inflammation visible in the moment of fracture, extraction should proceed by separating the gingival attachment and removing the smallest possible portion of the bone with the aim of avoiding the separation of the tuberosity from the periosteum. In case of the failure of the separation attempt resulting in the removal of the infected tooth with the adjacent tuberosity, tissues must be closed with interrupted sutures in order to prevent oro-antral communication. If a tooth does not show the attending signs of infection or pus content, a surgeon may attempt the application of an autogene graft (14).

In our case we applied the routine interrupted sutures to immobilize the fractured tuberosity to-

gether with the tooth. Considering that we did not have any complications prior to the definitive solution, i.e. the surgical extraction of the tooth after three months, this simple therapeutic approach proved to be very effective. As mentioned earlier, the extraction was performed surgically, the tuberosity was preserved intact and that was ultimately our aim and the best outcome for the patient.

5. Conclusions

Maxillary tuberosity fracture should be considered as a potential complication during the extraction of maxillary molars.

Most fractures are preventable by the application of a careful, trauma-free extraction technique followed by the ridge stabilization and separation of roots which is in the remit of general dental practitioners.

In tuberosity fracture all options of its fixation should be considered aimed at enabling its tethering.

A patient must be informed about the tuberosity fracture, given first aid and referred to a specialist unit for treatment.

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