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Problematic Extraction Socket Healing: Clinical Presentation and Management

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ABSTRACT

Objective: Problematic extraction socket healing is a post-operative problem that may result in repeated hospital visitation. The aetiology is uncertain as healing can be disturbed at any stage. The management of this condition is structured towards commencement of normal healing of the extraction socket. This study was undertaken to highlight the different clinical manifestations of problematic extraction socket healing and the different modalities undertaken to promote the commencement of the normal healing of the extraction wound.

Methods: All patients who presented in the Oral Surgery Clinic of the Dental Center of Central Hospital, Benin, between March, 2015 and April, 2016, with any complaint from the extraction socket were included in this study.

Results: A total of 44 patients that met the inclusion criteria during the study period were recruited. Presenting complaint varied from pain to bleeding or a hole in the gum, in a period of 3 days to 20years post extraction. Females accounted for 75%, the 21-30 and 31-40 years age group made up the majority of patients at 23% each. For 48% of patients it was their first extraction. Extraction socket filled with greyish necrotic tissue was found in 31% cases and empty socket with jagged bone was found in 5% of cases.

Commencement of normal healing was accelerated by exploration and evacuation of the contents of the socket; compression of the socket only or with intra-alveolar dressing inserted.

Conclusion: Pain was the major presenting complaint, while a majority of sockets on clinical examination had greyish necrotic tissue. Outcome of management was satisfactory with or without intra-alveolar dressing of extraction socket.

Keywords: Extraction socket, Clinical presentation, Management.

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INTRODUCTION

Following extraction, the socket goes through a series of healing events.[1,2,3,4] It starts with bleeding and a clot filling socket within 24 hours. The clot breaks down as granulation tissue within 2 to 3 days. On the third day after the extraction, osteoclasts are found at the crest of the alveolus and fibroblasts would have proliferated into the socket's blood clot by the end of the third day. Within 4 to 5 days the granulation tissue covers alveolar bone ridge, and the epithelium proliferates along the soft tissue periphery covering the granulation tissue. Bone regeneration is noted in the lower one third of the fundus of the socket on the fifth day. The alveolus is filled with connective tissue, osteoid begins to mineralize, and socket surface is covered with epithelium by the third week. At 5 weeks, it is estimated that about two-thirds of the extraction socket had been filled with bone. Epithelium, in some studies was found to require a minimum of 24 days to completely cover the extraction socket, with some extraction sites requiring up to 35 days to cover the socket completely.[1] The epithelium was found to grow progressively, enveloping islands of granulation tissue, debris, and bone splinters. It is noted by some authors that all stages of bone regeneration progressed from the apex and periphery and proceeded finally to the center and crest of the extraction socket.[1] At three months, two-thirds of the remodeling that will take place would have been complete. The knowledge of these stages helps to explain the pathogenesis of any disturbance of healing[4,5] which in turn leads to delay in wound healing. Distorted extraction socket healing is a post-operative problem that results in repeated hospital visitation because of pain, exudate, foul odor and other local symptoms. The consequence of the prolonged healing period is lost days at work and a reduction in productivity.[6] Infectious complications can occur when the formation of coagulum does not take place or is altered by early fibrinolysis. There can be simple, granulomatous and dry alveolitis which will present with pain two to four days after surgery.[5]

Another classification of infectious complications of extraction which is based on the duration of healing, includes alveolar osteitis, suppurative osteititis, necrotic osteititis and fibrous healing.[7] Other causes of problematic extraction socket healings have been described in the literature and they include squamous cell carcinoma and acute leukemia.[8,9] Aetiology may not be firmly established, since disturbances can occur at any stage of the healing process[5] and the condition could be due to a wide variety of reasons.[8,9] Management is geared towards the control of the symptoms until normal healing can commence. This study was undertaken to highlight the different clinical manifestations of problematic extraction socket healing and the different modalities undertaken to promote the commencement of the normal healing of the extraction wound.

MATERIALS AND METHODS

This study was carried out in the Oral Surgery Clinic of the Dental Center of Central Hospital, a secondary health facility in Benin City, Edo State of Nigeria. All patients that presented between March, 2015 and April, 2016 with any complaint from extraction sockets were the study population. On the day of presentation, data was collected for gender, age, post-extraction interval, presenting complaint and extraction history. The various forms of clinical presentation and the treatment given were all noted and documented. The extraction socket was examined and photographed. The visualization and time of presentation were used to determine the stage of healing and corresponding stage of disturbance in the healing process.[4] The clinical information from above determined the type of treatment administered to the patients.

At different stages of visitation and treatment, the various sockets were examined and photographed for assessment in progress of healing. Data analyzed included gender, age, time of presentation and presenting complaint. The number of times patient had undergone extraction and types of clinical presentation were also included.

RESULTS

A total of 44 patients made up the sample size in this study. Females accounted for 75% at 33 in number while males at 25% were 11 in number. The 21-30 and the 31-40 years age group made up the majority of patients at 23% each accounting for 10 patients in each group (Table 1).

Table 1: Age and gender distribution of the patients

Age (years)	Male	Female	Total n(%)
21-30	3	7	10(23)
31-40	3	7	10(23)
41-50	1	3	4(9)
51-60	1	2	3(7)
61-70	2	7	9 (20)
71-80	1	7	8 (18)
Total	11(25)	33(75)	44(100)

Table 2: Presenting complaint among the patients

Complaint	Frequency (%)	Percent (%)
Pain	25	57
Bleeding	6	14
Bone/tooth in socket	5	11
Pus/salty substance	4	9
Opening/tear in gum	4	9
Total	44	100

Table 3: Clinical appearance of presenting complaint among the patients

Clinical appearance	Gender	n	Percent
Necrotic tissue	Male	3	
	Female	10	13/31%
Bone	Male	1	
	Female	2	3/ 7%
Bone spicule/ retained root	Male	0	
	Female	5	5/12%
Granulation tissue	Male	2	
	Female	5	7/17%
Bleeding from socket	Male	2	
	Female	3	5/12%
Pus exudate from socket	Male	2	
	Female	2	4/9%
Opening/slit in gingiva over socket	Male	0	5/12%
	Female	5	

Table 4: Previous extraction pattern among the patients

Previous Extraction	Male	Female	Percent (%)
1st extraction	7	14	48
2nd extraction	1	9	23
3rd extraction & more	3	10	29
Total	11	33	100

According to presenting complaints of the patients in this study, more than half of the patients 57% (n=25) presented with pain and the least number of patients at 9% each presented with a tear or slit in the gum and the others with pus exudate or salty taste in the mouth (Table 2). The problematic extraction socket healing was the first extraction in nearly half (48%) of the patients (Table 3). According to presentation of the extraction socket by visualization, empty sockets and those with necrotic tissue were in the majority at 31% and bony sockets were the least at 7% (Table 4).

Clinical presentation:

Examination by visual assessment: Figures 1-8 are clinical photographs showing the clinical presentation of problematic extraction socket healing. Figure 1a & b: Necrotic tissue which accounted for 31%. Figure 2 a, b,& c: Granulation tissue accounted for 17%. Figure 3: Slit in the gingiva was 12%. Figure 4: Retained root/ bone spicule was also 12%. Figure 5: Bleeding from the socket was 12%. Figure 6a&b: Purulent discharge accounted for 9%. Figure 7a & b: Exposed bone was 7%. Figure 8: clinical photograph of the same patient at different times of presentation. a)Exfoliated sequestrum. b) Edentulous mandible

Figure 1(a) : Necrotic tissue

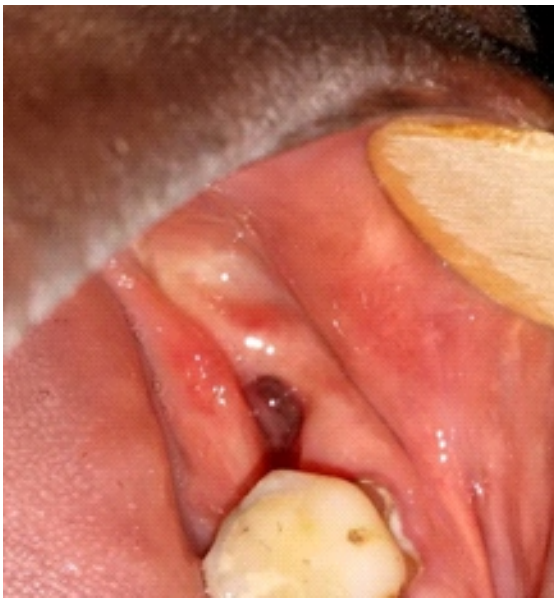

Figure 1(b): Necrotic tissue

Figure 2(a): Granulation tissue

Figure 2(b): Granulation tissue

Figure 2(c): Granulation tissue

Figure 3: Slit in the gingiva

Figure 4: Retained root

Figure 5: Bleeding from socket

Figure 6 (a): Purulent discharge

Figure 6 (b): Purulent discharge

Figure 7 (a) : Exposed bone

Figure 7 (b): Exposed bone

Differential diagnosis:[5,10]

a. Alveolar osteitis is considered to occur up to 7 days post extraction.
b. Acute suppurative inflammation<1month
c. Chronic inflammation>1 month
d. Bone spicule can be obvious clinically. Retained root is obvious visually or with a radiograph.

Investigation:

Indications for investigation were:

a) For lesions which presented after 5 weeks: when epithelium would have completely covered the extraction socket in normal healing;5 and
b) For patients that insisted there was a tooth/root in socket

Figure 8 (a): Exfoliated sequestrum

Fgure 8 (b) Edentulous mandible

Figure 9: Periapical x-ray showing an empty socket

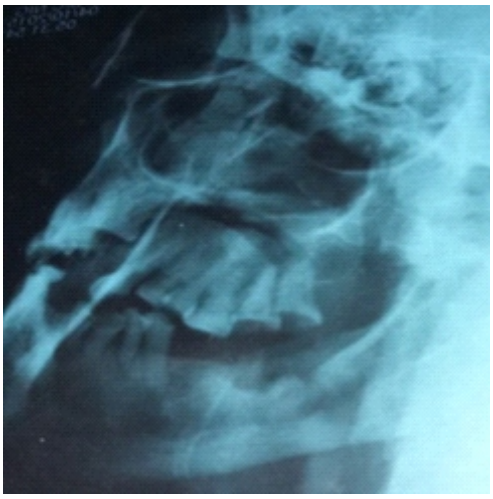

Figure 10: Oblique lateral view of the jaw with sequestrum in the apex of the position of the 3rd molar

Investigations carried out were:

- Fasting Blood Sugar (FBS)
- Intra-oral radiographs (periapical x-ray: Figure 9)
- Extra-oral radiographs (oblique lateral view: Figure 10)
- Histopathology-exploring the socket; sending tissue for pathology

Treatment:

Objective of treatment was to control pain and other symptoms (exudate; retained root; bone spicule) and institute measures that will lead to commencement of normal healing.

A. Socket compression alone after irrigation of socket

   Criteria for socket compression were:

   a) When socket appeared to be gaping instead of the buccal and lingual walls to be approximated;

   b) When tenderness was elicited when the finger was run along the buccal wall of the socket

B. Intra-alveolar dressings/medicaments. ZnO/E impregnated in gauze flakes, With/without compression of Socket.11

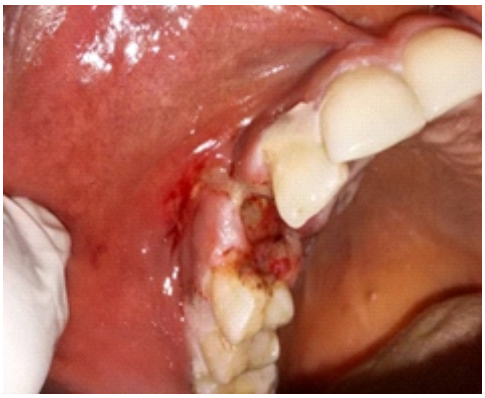

Figure 11(a):Occlusal view of socket, 3 days post extraction

Figure 11(b): Occlusal view of socket after dressing with gauze flakes impregnated with ZnO/E

Figure 12(a) : Occlusal view of socket 4 years after extraction

Figure 12(b) : Occlusal view of socket after flap has been raised

Figure 12 (c) : Occlusal view of socket 1 week post operatively with intra-alveolar dressing

Figure 13(a) : Occlusal view of socket on presentation (6years post

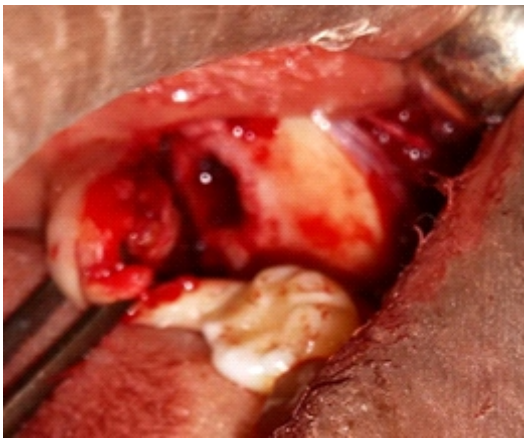

Figure 13(b) : Occlusal view of socket after flap has been raised

Figure 13 (c) : Occlusal view 1 week post- operatively

Figure 13(d) : Healing at 6 weeks

DISCUSSION

The healing of an extraction socket is not a major clinical concern because most extraction wounds, like most mouth wounds, heal rapidly under normal conditions. The occasional exception, however, can cause great discomfort and delayed healing, thereby interfering with subsequent dental treatments.[4] Such great discomfort in the form of pain was why a majority of patients in this study (57%) visited the clinic, post- extraction. In post-extraction wound healing, pain has been identified as a key factor alerting patients to seek care out of concern for the disturbed healing.[12]

Disturbances can occur at any stage of the healing process and can intercept the normal migration of replacement tissues. Not all stages of disturbance in healing is symptomatic.[4]This was observed in this study by the varying times of presentation by the different patients, with patients presenting up to twenty years post- extraction.

This problematic extraction sockets were found to be more common in females and accounted for 75% of patients seen in this study. Additionally, it was observed that disturbances of socket healing, was not recorded for patients below twenty years of age in this study. This is supported by the work of Engeland[13], who observed in different studies that age and sex have both been shown to play critical roles in healing. The author also discovered that when controlled for ethnicity, alcohol, nicotine use, or body mass index, older individuals had significantly slower healing than younger individuals. Other authors have noted that the frequency of alveolitis increases with age and that they are rarely found in children, seemingly because of a better vascularization.[5] In this study, it was observed that irrespective of the age group, women healed more slowly than men. This is also supported by another study by Engeland,[14] who discovered that the amount of testosterone present could be the causative factor in this change in healing with respect to age and the effects of slower healing in women at increased ages could be secondary to menopause.

The frequency of previous extraction was noted for patients in this study. It was observed that for 2 female patients, a second episode of problematic healing after extraction was reported by them. Interestingly this twenty five year old was on oral contraceptives on the two occasions. Only two patients in this study admitted they were on oral contraceptives. In a study by Adeyemo et.al,[6] none of the female patients admitted they were on oral contraceptives. The second female, an eighty year old, who has had several extractions, had biopsy and specimen came out as chronic osteomyelitis. An exfoliated sequestrum from the opposite side of the jaw can be seen in (figure 8a &b). Healing for older patients is characterized by a decrease in the inflammatory response and in the proliferation of fibroblasts. A reduction in the synthesis of collagen, of angiogenesis and of epithelialization may be related to decrease in cellular capacity to produce and react to growth factors.[5]

Studies have indicated that the various processes involved in healing may additionally be altered by a general illness.[5] One of the investigations carried out for older patients with problematic healing sockets in this study was fasting blood sugar. One patient, a sixty five year old female had blood sugar level above the acceptable normal standard in our environment. Controlling glycemia appears to be fundamental for normal healing, because hyperglycemia alters the leukocyte functions, decreases phagocytosis and increases the risk for infection.[5]

The principles surrounding the extraction process and post-operative care vary. The first line of treatment is the compression of the socket immediately after tooth extraction. This is

subjective and governed by the judgment of the dentist performing the procedure.[15] Socket compression is the process of placing digital pressure on the buccal and lingual/palatal aspects of the alveolus following extraction of the tooth.[16,17,18,19] Sufficient pressure is applied to re-approximate the alveolus that is expanded due to luxation of tooth during extraction. The compression is carefully done to prevent crushing or fracturing the bony walls.[20] The reason for this is to reduce the wound dimensions, which in turn is supposed to lead to faster healing by re-approximating the buccal and lingual/palatal plate.[21,19,22] Additionally it is said to reduce the bony undercuts,[15] reduce post-operative pain,[19] and help retain the blood clot.[16]

In this study, compressing the socket was found to be beneficial in a majority of patients in which the walls of the alveolus was observed to be gaping and not approximated. It was also observed to be beneficial to patients that the buccal walls of their alveolus were tender, protruding or appeared discontinued on palpation. Compressing the socket walls only, was found to be satisfactory in the patients who presented within seven days of extraction in this study.

Another local measure found to be satisfactory, was zinc oxide eugenol (ZnO/E) dressing in gauze flakes. This was placed in deep empty sockets or those with exposed bone. It has sedative and anodyne effects as well as antibacterial properties. This mixture of eugenol with zinc oxide relies on a setting reaction between them which produces zinc eugenolato. Eugenolato is not stable in the presence of water, and readily undergoes hydrolysis with the release of free eugenol. Free eugenol can also be of detriment to human soft tissues. The type and extent of oral tissues reactions to eugenol vary but eugenol is generally cytotoxic at high concentrations and has an adverse effect on fibroblasts and osteoblast-like cells. Thus, at high concentrations, it produces necrosis and reduced healing. This effect is dose related and will potentially affect all patients.[23,24] Eugenol is neurotoxic, that is having the capacity to cause interruption of neural transmission. Transient paresthesias have been reported after the use of eugenol as an endodontic medication.[25,26]

Therefore, the mixing of ZnO/E is very important. A creamy mixture is to be avoided because it contains a high concentration of eugenol. A mixture that is biased towards a more powdery consistency was discovered by the author to be favourable. Gauze flakes incorporated in the mixture made it loose and not a lump of solid mass that sets to a very hard consistency, which does not dissolve. Finally, providing patients with written postoperative instructions stating what was placed in the socket, how long it should stay in the socket, and when or if it should be removed, should not be overlooked by treating physician.[27]

The removal of foreign body in the form of an extraction of retained roots or bone spicule with attendant compression of the socket walls is another form of treatment depending on the mode of presentation. It is not uncommon for the bones which formerly supported the tooth to shift and in some cases to erupt through the gums, presenting protruding sharp edges which can irritate the tongue and cause discomfort.[28]

An open surgical method which involved raising a flap, curetting the socket and sending the contents for histopathology was carried out in this study. The results recorded included local alveolitis and chronic osteomyelitis. This was significant because all patients presented three months to twenty years post extraction.

Antibiotics were administered to all patients not previously on antibiotics. For those that were on antibiotics on presentation in the clinic, they were advised to continue till the recommended time.

A Cochrane study on the use of antibiotics before and after extraction of wisdom teeth, concluded that there was enough scientific evidence showing that antibiotics administered just before and/ or after a surgical procedure reduced the risk for infection, pain and dry socket after extraction.[29]

The postoperative procession of a wound depends not only on care but also on the behaviour of the patient. Excessively rinsing the mouth on the day of the operation, tobacco or alcohol consumption, as well as exerting strenuous physical effort can lead to the loss of the coagulum and consequently infection.[5]

CONCLUSION

Problematic healing extraction socket can result from any stage of disturbance in socket wound healing hence the different clinical presentation. All stages of disturbances are not symptomatic hence not all patients presented with pain. Management of this condition should begin with patient education. Treatment is eventually geared towards preparation of the socket for normal wound healing. The Surgeon should ensure that the extraction is atraumatic because atraumatic tooth extraction is very important to preservation of alveolar bone volume and surrounding soft tissues.

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