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RESEARCH ARTICLE

A COMPARATIVE STUDY OF DELAYED AND IMMEDIATE TOOTH EXTRACTION IN THE PRESENCE OF ACUTE INFECTION

***,[1]Dr. Fasalulla, O., [1]Dr. Akhilesh, A. V., [2]Dr. C. R. Sobhana, [1]Dr. Sandhya, K., [1]Dr. Ravindran, V. and [3]Dr. Sandeep Rajan**

[1]Department of Oral and Maxillofacial Surgery, Government Dental College, Kozhikode, Kerala, India
[2]Department of Oral and Maxillofacial Surgery Government Dental College, Thiruvananthapuram, Kerala, India
[3]Oral and Maxillofacial Surgeon, Nyle Super Specialty Hospital, Kaipparambu, Thrissur, Kerala

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ABSTRACT

Background: Odontogenic infections are commonly encountered in the dental hospital. One of the oldest controversies in the field of Oral and Maxillofacial Surgery is whether or not to extract teeth immediately in the presence of acute infection. Many dentists and physicians still believe that extraction of teeth in the presence of an acute infection may cause the organism to seed into the fascial spaces and cause spread of infection in the host.

Objectives: The purpose of this study is to compare immediate and delayed extraction in the presence of acute infection and to provide the clinician evidence based recommendations on the extraction of teeth in the presence of acute infection.

Patients & Methods: Fifty patients fulfilling the inclusion criteria were selected. Extraction was performed in Group 1 at the first visit itself and postoperative antimicrobial coverage was given. Extraction was performed in Group 2 after antimicrobial coverage and continued the postoperative medication. All patients in both the groups were given same type of antibiotic and analgesic. Two groups were evaluated for pain, mouth opening, duration of treatment and medication, cost of the treatment and no. of visits.

Results: Significant differences were not observed for pre and postoperative pain and mouth opening between the groups. Early extraction of teeth reduced the duration of treatment, duration of antibiotic and analgesic therapy, cost of the treatment and number of hospital visits and hence increased overall patient comfort.

Conclusion: Extraction of acutely infected or abscessed teeth as early as possible prevents the spread of infection in to the fascial spaces and thus reduces the patient discomfort. The belief that the extraction of an infected tooth might spread the infection is unsubstantiated.

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INTRODUCTION

Dentistry is primarily concerned with the treatment of dental infection or the restoration, removal and replacement of dentition decayed due to bacterial infection. Odontogenic infections have afflicted human beings as long as our species has existed. Remains of early Egyptians and pre-Columbian Indians, unearthed in American Midwest have been discovered with signs of dental abscesses and evidence suggesting osteomyelitis (Rega *et al*., 2006; Goldberg and Topazian, 2002). The oral cavity harbours over 500 bacterial taxa, several fungal species, protozoa and viruses. Health is determined by a balance in the interaction between the host, organism and the environment. Infections occur when this harmony is perturbed[3]. Host defence mechanisms play a major role in determining the outcome of an infection; the environment and the microorganism play important yet secondary roles.

- Oral infections are one of the commonest infections affecting mankind. Vera (Maestre-Vera, 2003) in 2004 proposed a simple classification of oral infections into two large groups:
- Odontogenic infections: caries, periodontitis, periapical abscess, periodontal abscess, pericoronitis, pulpitis, osteitis and infection of the aponeurotic spaces, among others.
- Non-odontogenic infections: affecting the mucosa, salivary glands, etc.

Corresponding author:* **Dr. Fasalulla, O.
Department of Oral and Maxillofacial Surgery, Government Dental College, Kozhikode, Kerala, India.

Oral infection can originate in the pulp and reach periapical region via the root canals. It may also originate from the periodontal tissues and spread through spongy bone. It then perforates cortical bone and spreads into potential tissue spaces or discharges through a sinus opening in the mucosa or skin. Further spread depends on the type and virulence of the organism, general health and immune status of the host and anatomic site of the focus of infection. Early intervention helps to prevent complications like sepsis, mediastinitis, airway compromise etc. Most Odontogenic infections resolve on removal of the focus of infection with or without the use of antimicrobial agents. The incidence and mortality of life threatening infections have been dramatically reduced by aggressive surgical intervention. Antimicrobials are frequently used in dental practice. Clinical, bacteriological and epidemiological factors determine the indications of antimicrobials in dentistry. Antimicrobials are used in addition to appropriate treatment to aid the host defences in the elimination of remaining microorganisms. It is indicated when there is evidence of clinical sign and spread of infection. Antibiotics are prescribed in dental practice for treating odontogenic infections, non-odontogenic infections, as prophylaxis against focal and local infection. They should be used only as an adjunct to dental treatment and never alone as the first line of care[5]. One of the oldest controversies in the field of Oral and Maxillofacial Surgery is whether or not to extract teeth immediately in the presence of acute infection[6]. Many dentists and physicians still believe that extraction of teeth in the presence of an acute infection may cause the organism to seed into the fascial spaces and cause spread of infection in the host (Frew, 1937). The purpose of this study is to compare immediate and delayed extraction in the presence of acute infection and to provide the clinician evidence based recommendations on the extraction of teeth in the presence of acute infection.

PATIENTS AND METHODS

The prospective study was conducted in the Department of Oral and Maxillofacial Surgery, Government Dental College, Trivandrum during the period from March 2013 to March 2014.The sample size has been calculated using the formula:

$$N=\frac{2\ S^2\ f\ (\alpha,\beta)}{d^2}$$

N – Sample Size, S- Standard Deviation, d – Clinically Significant Difference. With an error of 7 %, the samples size required for the present study was calculated as 49 subjects, which was rounded off to 50 subjects and were divided in to 2 groups of 25 each.

Group 1: Extraction of tooth in the presence of acute infection and postoperative antimicrobial coverage.

Group 2: Delaying of extraction for few days in the presence of acute infection and extraction during follow up after antimicrobial coverage. There was no gender predilection and patients with acute infection requiring removal of mandibular posterior tooth were included in the study.

Exclusion criteria includes

1) Patients requiring surgical removal of mandibular posterior tooth
2) Patients with inadequate mouth opening for proper instrumentation
3) Patients with uncontrolled systemic diseases
4) Patients already under medication for the dental infection
5) Pregnant patient

The outcome variables measured are

1) Pain (Measured using Visual Analogue Scale) (Figure 1)
2) Mouth opening (calculated using vernier callipers)
3) Duration of the treatment
4) Duration of the antibiotic and analgesic therapy, type of drugs used
5) Cost of the treatment
6) No of visits

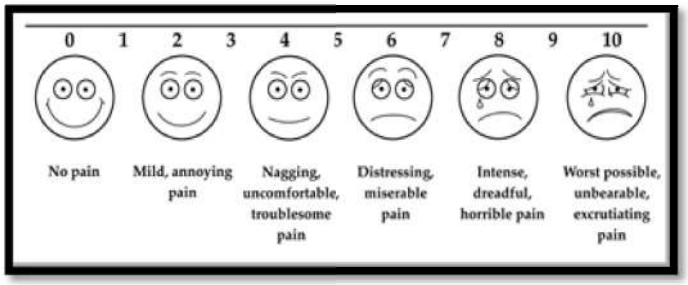


Figure 1. Visual analog scale

Procedure

Patients were first clinically screened for mandibular posterior tooth with acute infection and a proforma was formulated to record the patient's personal details as well as clinical examination with all important clinical parameters. Intraoral periapical radiograph and orthopantomogram were taken as and when required.50 patients with acute infection were divided in to 2 Groups (Group 1 and Group 2), with 25 patients in each group. The first patient satisfying the prescribed criteria was allotted to group 1 and the second patient to group 2.Extraction was performed in Group 1 at the time of first visit itself and postoperative antimicrobial coverage was given. Extraction was performed in Group 2 after antimicrobial coverage and continued the postoperative medication. All extractions were performed under local anaesthesia by the same surgeon. All patients in both the groups were given same type of antibiotic (Amoxicillin 500 mg TID) and same type of analgesic (Ibuprofen 400mg and paracetamol 500mg, TID). Patients of both groups were evaluated 5 days after the extraction. The wound was closed with 3-0 black silk, if indicated.

Ethical considerations

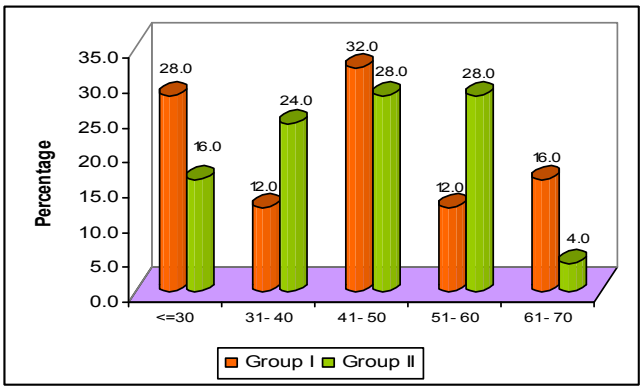
Permission from the institutional ethical committee was obtained prior to conducting the study. An informed consent was taken from patients who agreed to participate in the study.

Statistical analysis

Data was analysed using suitable computer software and following statistical tools were used for analysis: Chi-square test, Mann Whitney U test and Student's t test.

RESULTS

A total of 50 patients with age ranging from 14 to 70 years were studied. Maximum number fell in the age group of 41 to 50 years. The gender distribution was almost equal with 26 males and 24 females. The mean age for group 1 was 41.3 years with a standard deviation of 16.9 years and the mean age for group 2 was 43.4 with a standard deviation of 11.8 years. So the age group was not significant (p =0.61) between the groups. (Graph 1)



Graph 1. Comparison of age based on group

For majority of patients (56 % in group 1 and 60 % in group 2), the pain at the time of first visit was 'intense, dreadful, horrible pain' (pain score 7-8 in visual analogue scale) (Table 1). The mean preoperative pain at the time of first visit was 6.5 with a standard deviation of 1.5 for group 1 and 7 with a standard deviation of 1.5 for group 2. Pre operative pain at the time of first visit was not significant (p=0.194) between the groups (Table 2).

Table 1. Distribution of level of pre operative pain between groups

Pain	Group I		Group II	
	Count	Percent	Count	Percent
Nagging, uncomfortable, troublesome pain	5	20.0	2	8.0
Distressing, miserable pain	5	20.0	6	24.0
Intense, dreadful, Horrible pain	14	56.0	15	60.0
Worst possible, unbearable, excruciating pain	1	4.0	2	8.0

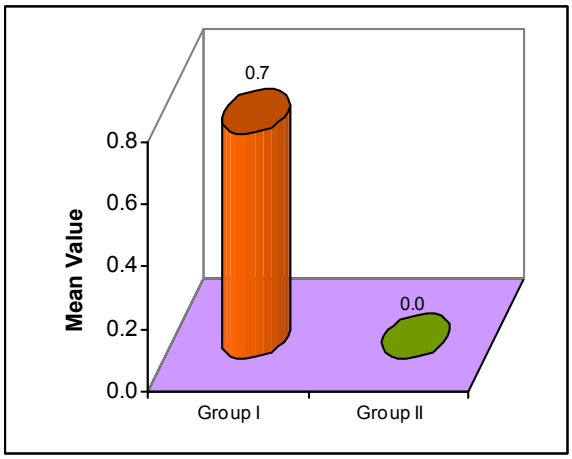
Table 2. Comparison of pre-operative pain based on group, # Mann-Whitney U Test

Group	Mean	SD	N	Z#	P
Group I	6.5	1.5	25	1.3	0.194
Group II	7.0	1.5	25		

After 5 days of extraction, in group 1, majority of patients (60%) experienced no pain, some patients experienced mild annoying pain and only few patients (8%) experienced nagging, uncomfortable pain (pain score 3-4 in visual analogues scale). In group 2, there was no postoperative pain after 5 days (Table 3). So, the postoperative pain was statistically significant (p<0.01), but the pain experienced in majority of patients were only mild, annoying pain and no more medications were prescribed for them and no patients experienced distressing, intense or unbearable pain (Graph 2).

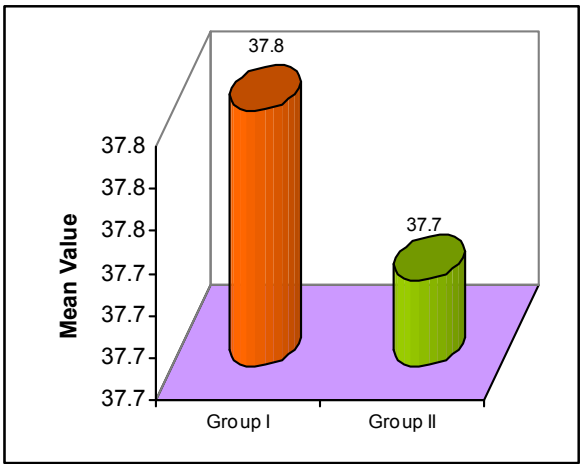
Table 3. Distribution of level of post-operative pain between group

Pain	Group I		Group II	
	Count	Percent	Count	Percent
No pain	15	60.0	25	100.0
Mild, annoying pain	8	32.0	0	0.0
Nagging, uncomfortable, troublesome pain	2	8.0	0	0.0



Graph 2. Comparison of level of post operative pain based on group

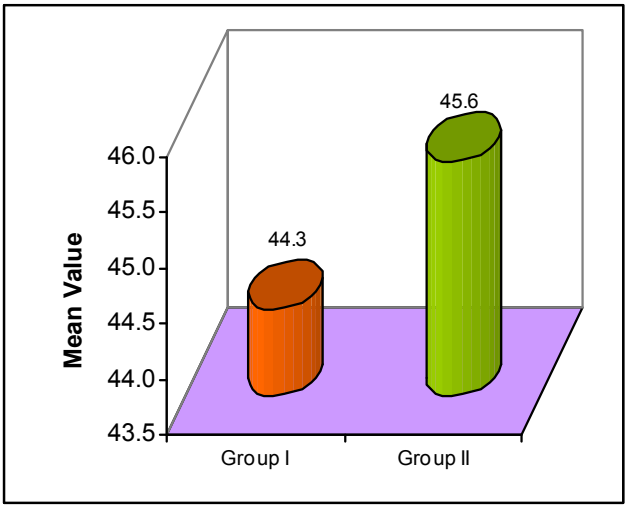
The mean preoperative level of mouth opening at the time of first visit in group 1 was 37.8mm with a standard deviation of 6.5mm and 37.7mm in group 2 with a standard deviation of 9.1.mm The preoperative level of mouth opening at the time of first visit was not significant (p=0.972) between the groups (Graph 3).



Graph 3. Comparison of pre-operative level of mouth opening based group (in mm)

The mean postoperative mouth opening after 5 days of extraction was 44.3mm with a standard deviation of 2.9 in group 1 and 45.6mm with a standard deviation of 3.3mm in group 2(Graph 4). The postoperative level of mouth opening after 5 days of extraction was not significant (p=0.139) between the groups.

Duration of treatment for majority of patients (76 %) in group 1 was four days and majority of patients in group 2 (92 %) was seven days. Duration of treatment was significant (p =0.000) between the groups (Table 4).



Graph 4. Comparison of post operative level of mouth opening based on group (in mm)

Table 4. Comparison of duration of treatment based on group # Mann-Whitney U Test ,: - Significant at 0.01 level**

Duration of treatment (Days)	Group I		Group II		Z#	p
	Count	Percent	Count	Percent		
4	19	76.0	0	0.0	6.01**	0.000
5	3	12.0	0	0.0		
7	3	12.0	23	92.0		
8	0	0.0	2	8.0		

Duration of antibiotic and analgesic therapy for majority of patients (76 %) in group 1 was four days and in group 2 (92 %) was 7 days. Duration of antibiotics and analgesic therapy was significant (p =0.000) between the groups (Table 5).

Table 5. Comparison of duration of antibiotic and analgesic therapy based on group# Mann-Whitney U Test: - Significant at 0.01 level**

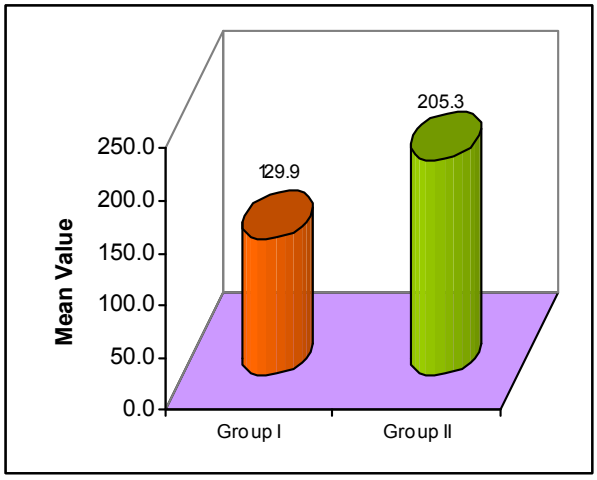
Duration of treatment	Group I		Group II		Z#	p
	Count	Percent	Count	Percent		
4	19	76.0	0	0.0	6.01**	0.000
5	3	12.0	0	0.0		
7	3	12.0	23	92.0		
8	0	0.0	2	8.0		

Number of visits for majority of patients (92 %) in group 1 was two days and in group 2 (96%) was three days. Number of visits was significant (p =0.000) between the groups (Table 6).

Table 6. Comparison of no. of visit based on group # Mann-Whitney U Test: - Significant at 0.01 level**

No. of visits (Days)	Group I		Group II		Z#	p
	Count	Percent	Count	Percent		
2	23.0	92.0	0	0.0	6.41**	0.000
3	2.0	8.0	24	96.0		
4	0.0	0.0	1	4.0		

Cost of treatment for group 1 was 129.9 rupees with a standard deviation of 29.1 rupees and group 2 was 205.3 rupees with a standard deviation of 8 rupees. Cost of the treatment was significant between the groups (p=0.000) (Graph 5).



Graph 5. Comparison of cost of treatment based on group (in rupees)

DISCUSSION

Historically, the potential for dental abscess to spread and cause sepsis and death has been known but the role of bacteria was recognized only at the turn of the 20th century (Turner Thomas, 1908). Teeth were considered 5th or 6th leading cause of death when the Bills of Mortality (London) began listing causes of death in the early 1600s (Clarke, 1999). By the turn of 20th century, dental infections were associated with a mortality of 10-40% (Turner Thomas, 1908). One of the oldest controversial topics in the field of oral and maxillofacial surgery is whether or not to extract teeth immediately in the presence of an acute infection. Many dentists and physicians still believe that extraction of teeth in the presence of an acute infection may cause the bacteria to seed into the fascial spaces and cause life-threatening infection in the host. The proponents of delayed extraction recommended postponing the extraction until the infection localizes and the inflammatory response subsides. A large part of this belief came from reports in literature about patients developing severe life-threatening deep fascial space and central nervous system (CNS) infections, or septicemia after extraction of infected teeth. The controversy continued into recent times, with some investigators favoring resolution of infection before tooth removal and others favoring immediate extraction (Johri and Piecuch, 2011).

The proponents of immediate extraction like Wainwright (Wainwright, 1940) supported immediate extraction stressing that a necrotic tooth, devoid of blood supply and gangrenous pulp, acts as a “foreign body” and as a “culture medium” and should be removed as quickly as possible. He suggested that extraction of the tooth re-established the blood supply as well as provided drainage and relieved pain and pressure from the infection. Gluck (1939) stressed that immediate extraction avoids putting the patient through continual pain, decreased sleep, and decreased oral intake. In our study with age ranging from 14 to 70 years, maximum number of patients fell in the age group of 41 to 50 years with the mean age for group 1 was 41.3 and for group 2 was 43.4 years. This was similar to Rud’s study in 1970. Rud reported an age range of 16 to 79 years, with a peak between 20 and 26 years (Rud, 1969). Martis, Karabouta, and Lazaridis study in 1978 involved patients aged 17 to 50 years and most of them were between 20 and 27 years (Martis *et al*., 1978). In our study, the age was not significant between the groups.

For majority of patients, the pain at the time of first visit was 'intense, dreadful, horrible pain' (pain score 7-8 in visual analogue scale). The mean preoperative pain at the time of first visit was 6.5 for group 1 and 7 for group 2. This was comparable with the study done by Martis, Karabouta, and Lazaridis in 1978. In their study, for majority of patients, preoperative pain was moderate (Rud, 1969). In our study regarding pre operative pain at the time of first visit, there was no significant difference between the groups. In group 2, there was no postoperative pain after 5 days. After 5 days of extraction, in group 1, majority of patients experienced no pain, some patients experienced mild annoying pain and only few patients experienced nagging, uncomfortable pain (pain score 3-4 in visual analogues scale).Even though the postoperative pain was statistically significant, the pain experienced in majority of patients were only mild, annoying pain and no more medications were prescribed. This was comparable with the study done by Martis, Karabouta, and Lazaridis. In their study, for majority of patients, postoperative pain was mild (Martis *et al*., 1978). The preoperative mouth opening ranges between 24-45 mm in group 1 and 29-47 mm in group 2. The mean preoperative level of mouth opening at the time of first visit in group 1 was 37.8 and in group 2 were 37.7. Since it was not affecting the instrumentation, extraction was performed. In our study regarding pre operative mouth opening at the time of first visit, there was no significant difference between the groups. The mean postoperative mouth opening after 5 days of extraction was 45.6 in group 1 and 44.3 in group 2. So, mouth opening was improved postoperatively after 5 days of extraction in both the groups. In our study, the postoperative level of mouth opening after 5 days of extraction was not significant between the groups. Duration of treatment for majority of patients in group 1 was four days and in group 2 was seven days. In our study, duration of treatment was significant between the groups. In another study by Kay (1966) in 1966, the treatment period was 5.5 days. Duration of antibiotic and analgesic therapy for majority of patients in group 1 was four days and majority of patients in group 2 was seven days. In our study, duration of antibiotics and analgesic therapy was significant between the groups. Number of visits for majority of patients in group 1 was two times and in group 2 was three times. In our study, number of visits was significant between the groups. Cost of treatment for group 1 was 129.9 rupees and group 2 was 205.3 rupees. In our study, cost of the treatment was significant between the groups.

Conclusion

The purpose of this study is to compare immediate and delayed extraction in the presence of acute infection and to contribute evidences in this current era of evidence based practice. Early extraction of causative tooth reduced the duration of treatment, duration of antibiotic and analgesic therapy, cost of treatment, the number of hospital visits and hence increased overall patient comfort. Early extraction along with postoperative antibiotics hastens recovery. Most of the results of our study were compatible with the literature. Early surgical intervention rather than merely relying on antibiotics, especially in acute maxillofacial infections will be more beneficial in terms of lessened hospital stay, which are exceedingly significant for countries of low budget health services. Early removal of the offending tooth removes the source of the infection and provides a path for evacuation of pus through the extraction socket, resulting in faster clinical and biochemical resolution of the infection (Igoumenakis *et al*., 2015). Moreover this eliminates the nidus of infection from the host and prevents extension of a localized infection into the fascial spaces. Even though there are different schools of thought in this subject, from our experience potential benefits of early extraction of an offending tooth in a setting of acute infection clearly justifies the potential risk.

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