

# **Single dose antibiotic prophylaxis in outpatient oral surgery Comparative study**

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Running title: Single dose in oral surgery

## **Abstract**

It is clear that correct application of antibiotic prophylaxis can reduce the incidence of infection resulting from the bacterial inoculation in a variety of clinical situations; it cannot prevent all infections any more than it can eliminate all established infections. Optimum antibiotic prophylaxis depends on: rational selection of the drug(s), adequate concentrations of the drug in the tissues that are at risk, and attention to timing of administration. Moreover, the risk of infection in some situations does not outweigh the risks which attend the administration of even the safest antibiotic drug. The aim of this study was to compare between 2 prophylactic protocols in out patients undergoing oral surgical procedures. Thirty patients, selected from the attendants of oral surgery clinic in Al-Karamah Dental Center, were subjected to different oral surgical procedures under local anesthesia. These patients were given single dose antibiotic prophylaxis in 2 groups; 1<sup>st</sup> group were 15 patients given 1million i.u. of procaine penicillin I.M. 30 minutes before oral surgery, 2<sup>nd</sup> group were 15 patients given 600mg clindamycin orally 1 hour before oral surgery. The maximum time for all procedures was 2 hours. There was no difference between procaine penicillin (1 million i.u.), and clindamycin (600mg), regimens concerning post operative infection in out patient's oral surgical procedures.

**Key words: Antibiotic prophylaxis, outpatient oral surgery**

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## ملخص البحث

من الواضح أن التطبيق الصحيح لإعطاء المضادات الحيوية لإغراض وقائية يمكن أن يقلل نسبة حدوث الاختلاطات البكتيرية الناتجة من النمو البكتيري بسبب عدد من الحالات السريرية المتنوعة. إن التطبيق الصحيح لا يمنع كل الاختلاطات البكتيرية ولكنه يستطيع التخلص من الاختلاطات الموجودة فعلا. إن النتيجة الأفضل للتعامل الوقائي للمضاد الحيوي يعتمد على الاختيار المنطقي للعقار المعطى والتركيز الكافي للعقار (المضاد الحيوي) في النسيج المهدد بالاختلاط البكتيري والانتباه للتوقيت عند إعطاء المضاد الحيوي . من الجدير بالذكر مخاطر بعض الاختلاطات البكتيرية لاستدعي إعطاء المضاد وهو أمر له سلبياته حتى مع أكثر المضادات أمانا.

إن غرض هذه الدراسة هو المقارنة بين بروتوكولين علاجيين وقائيين للمرضى الذين يخضعون لتدخلات جراحية في العيادات الجراحية لطب الأسنان (تحت التخدير الموضعي). تم اختيار ثلاثون مريضا من قبل المراجعين الذين يزورون قسم الجراحة في مركز الكرامة التخصصي لطب الأسنان حيث تم إخضاعهم لتدخلات جراحية متنوعة تحت التخدير الموضعي. هؤلاء المرضى ، تم إعطاؤهم جرعة مفردة من عقار البروكاين بنسلين وهي مليون وحدة عالمية وتم إعطاؤها عضليا (للمجموعة الأولى المكونة من 15 مريضا) وعقار الكلنداميسين 600 ملغم عن طريق الفم ( للمجموعة الثانية وتضم 15 مريضا) لم يتجاوز الوقت اللازم لإجراء التدخلات الجراحية ساعتان.

كانت النتيجة انه لم يكن هناك أي اختلاف بين المجموعتين من ناحية عدم حدوث الاختلاطات البكتيرية بعد التداخل الجراحي الفموي بأنواعه.

## **Introduction:**

The use of antimicrobial agents to prevent infection is effective in many circumstances, and it is limited to specific, well-accepted indication to avoid excess cost, toxicity, and antimicrobial resistance <sup>(1)</sup>. Preoperative topical, oral, and intravenous antimicrobial prophylaxis has been important in decreasing the incidence of surgical site infection <sup>(2,3)</sup>.

The time taken for an antibiotic to reach an effective concentration in any particular tissue reflects its pharmacokinetic profile and the route of administration <sup>(4)</sup>.

Administration of prophylaxis more than three hours after the start of the operation significantly reduces its effectiveness. For maximum effect, it should be given just before or after the start of the operation <sup>(5)</sup>.

Preoperative antimicrobial surgical prophylaxis is recommended for operative procedures that have a high rate of postoperative wound infection, when foreign materials must be implanted, or when the wound infection rate is low but the development of a wound infection results in a disastrous events. <sup>(2, 3, 6)</sup> Infection of the incised skin or soft tissues is a common but potentially avoidable complication of any surgical procedure. Some bacterial contamination of a surgical site is inevitable, either from the patient's own bacterial flora or from the environment. <sup>(7)</sup>

In procedures that require the insertion of implants or prosthetic devices, the term surgical site infection is used to encompass the surgical wound and the implant.

Surgical site infection also encompasses infections involving the body cavity (e.g. a. subphrenic abscess ), bones, joints, meninges and other tissues involved in the operation. <sup>(8)</sup> Prophylactic administration of antibiotics inhibits growth of

contaminating bacteria and their adherence to prosthetic implants, thus reducing the risk of infection. <sup>(9)</sup>

The goals of prophylactic administration of antibiotics to surgical patients are to: reduce the incidence of surgical site infection, use antibiotics in a manner that is supported by evidence of effectiveness, minimize the effect of antibiotics on the patient's normal bacterial flora, minimize adverse effects and cause minimal change to the patient's host defenses. <sup>(2)</sup>

It is important to emphasize that surgical antibiotic prophylaxis is an adjunct to, not a substitute for, good surgical technique. Antibiotic prophylaxis should be regarded as one component of an effective policy for the control of hospital-acquired infection. <sup>(10, 11)</sup>

The American college of surgeons classified wound surgery into 4 categories: clean, clean-contaminated, contaminated and dirty wound, according to this classification trans-oral wound is considered Clean contaminated, That is, Class II, these wounds should receive protection if (a) the patient has depressed host defenses. (b) A prosthetic device is being inserted. (c) The sequel of an infection is serious; and (d) some aspect of the procedure, such as increased duration or decreased local blood supply, makes infection more likely. <sup>(8,11)</sup> Prophylactic antimicrobial agents should be administered not more than 30 to 60 minutes before surgery. <sup>(8-9)</sup> Exceptions to this rule are cesarean procedures, colonic and urologic procedures. Therapeutic concentrations of antimicrobial agents in tissue should be present throughout the period that the wound is open. The duration of antimicrobial prophylaxis for the majority of procedures is controversial; however, experts recommend at most one or two postoperative doses. <sup>(2, 3)</sup>

The antibiotics chosen for prophylaxis can be those used for active treatment of infection. However, the chosen antibiotics must reflect local, disease-specific

information about the common pathogens and their antimicrobial susceptibility.<sup>(12)</sup> Procaine penicillin is one of the semi-synthetic penicillin obtained by alterations in the prosthetic group differ from the naturally occurring product (penicillin G) in three dimensions: their resistance to acid makes oral administration possible, they may be resistant to the action of penicillinase and their spectrum of antimicrobial activity is usually broadened for many streptococcal infections.<sup>(14)</sup> It is bactericidal, act by interfering with bacterial cell wall synthesis.<sup>(10)</sup>

Clindamycin is a bacteriostatic act by interfering with protein synthesis of bacteria. It is active against Gram positive cocci, including streptococci and penicillin-resistant staphylococci, and also against many anaerobes, especially *B. fragilis*<sup>(15)</sup>.

### **Subjects and methods:**

After a thorough history taking, clinical, and radiographic examination, thirty patients attending Al-karamah Dental Center were selected to participate in this study. These patients are mostly from the residents of the neighborhood, which is a relatively a low socioeconomic level. None of patients had medical history or active infectious process. All patients in this study are not allergic to penicillin.

These patients were subjected to oral surgical procedures under local anesthesia maximally 2 hours the surgical procedures involved bone and soft tissue and these includes: removal of impacted lower 3<sup>rd</sup> molar, Apicectomy for upper central and lateral incisors.

Patients were classified into two groups according to the antimicrobial agent:

1. 1<sup>st</sup> group were 15 patients given single I.M. doses of 1 million i.u. procaine penicillin 30 minutes before oral surgery.
2. 2<sup>nd</sup> group were 15 patients given 600mg clindamycin orally 1 hour before

surgery.

Number of female patients included in our study was 17, while the number of male patients was 13. Patients were classified into 3 groups. Group one (10-19) nine patients, group two (20-29) thirteen patients and group 3 (30-39) eight patients.

Surgical procedures included in this study were: removal of impacted lower RT 3<sup>rd</sup> molar (11 cases), removal of impacted lower LT 3<sup>rd</sup> molar (8 cases), removal of impacted of upper RT 3<sup>rd</sup> molar (1 case), apicectomy for upper RT central incisor (5 cases) apicectomy for upper LT central incisor (4 cases) apicectomy for upper RT lateral incisor (1 case).

Meticulous handling of the tissues, avoidance of unnecessary surgical trauma and copious irrigation of the wound before closure to remove foreign bodies and debris, leaving no potential foci for bacterial infections were of crucial importance in our measures.

Patients were examined 48 hours post-operatively to investigate the presence of any local and general signs of post operative infection these signs are: increased pain or tenderness, post operative swelling at the site of surgery, enlarged, tender regional lymph node and fever. The same investigated parameters were also examined 7<sup>th</sup> day after surgery, for suture removal.

## **Results:**

Characterization of patients according to age, gender & type of oral operation is given in figures 1, 2, and 3.

No postoperative infections were recorded in the two groups, and no postoperative complications in the two groups.

## **Discussion:**

Although some studies found that antibiotic prophylaxis in some oral surgical procedures is controversial<sup>(12,16,17)</sup>. Its generally agreed that when antibiotic prophylaxis is decided, the antibiotic must be present in the systemic circulation at a high level at the time of surgery and is usually given as one dose<sup>(17,18,19)</sup>. In spite of the fact that preoperative antibiotic prophylaxis is an established practice<sup>(17, 20)</sup>, there is no consistent protocol for the method or duration of drug administration in oral surgical procedures,<sup>(21)</sup> and this is true for Iraqi dental surgical centers. Although it is agreed that procedures entailing entry into the oropharynx or esophagus, need antibiotic coverage of aerobic cocci is indicated. Prophylaxis has been shown to reduce the incidence of severe wound infection by approximately 50 percent.<sup>(22)</sup> our choice for procaine penicillin depends on two factors

1. most of oral infections caused by penicillin sensitive bacteria<sup>(23)</sup>
2. The use of penicillin is an established clinical practice in advanced surgical centers<sup>(22,23)</sup>, on the other hand some of the studies select Clindamycin for antimicrobial prophylaxis in oral surgery, clindamycin is occasionally chosen for orthopedic surgical prophylaxis, where it has an excellent activity against *Staphylococcus* spp. and *Bacteroides fragilis*, but have no activity against enteric microorganism<sup>(22,24)</sup>. Also it has good reputation for tissue penetration, with almost the same effectiveness of penicillin against anaerobes.<sup>(13)</sup>

The minimum inhibitory concentration (MIC) of clindamycin is achieved within the first 2-3 dose intervals. Thus, stable drug concentration is then maintained for greater than 6 hours after the last dose.<sup>(13)</sup>

In our selected sample; female patients were more than the males, this may be

explained by the fact that females are more interested in oral hygiene. We have noticed that the number of patients in the age group (20-29) is higher than other age groups; this could be attributed to the fact that the problems of impacted 3<sup>rd</sup> molar or its complications are usually experienced in this age group.

No post operative infections were recorded in our sample, for all patient groups (no difference between parenteral and oral route of administration). We conclude that there is no difference in surgical prophylaxis between procaine penicillin (1 million i.u.), and clindamycin 600mg concerning post operative infection in out patient's oral surgical procedures, and this may be explained by the fact that both antibiotics used in this study covered both pathogens that are mostly involved in oral infections. This conclusion shown in figure (4) which represents surgical removal of impacted lower 3<sup>rd</sup> molar (group 2) and figure (5) which represents apicectomy for upper central incisor intraoperatively (group 1), figure (6) postoperatively for the same case, while figures 7,8 and 9 represent apicectomy for lower central incisor, preoperative, intraoperative and postoperative respectively (group 2).

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Figure 1 No. of patients according to gender

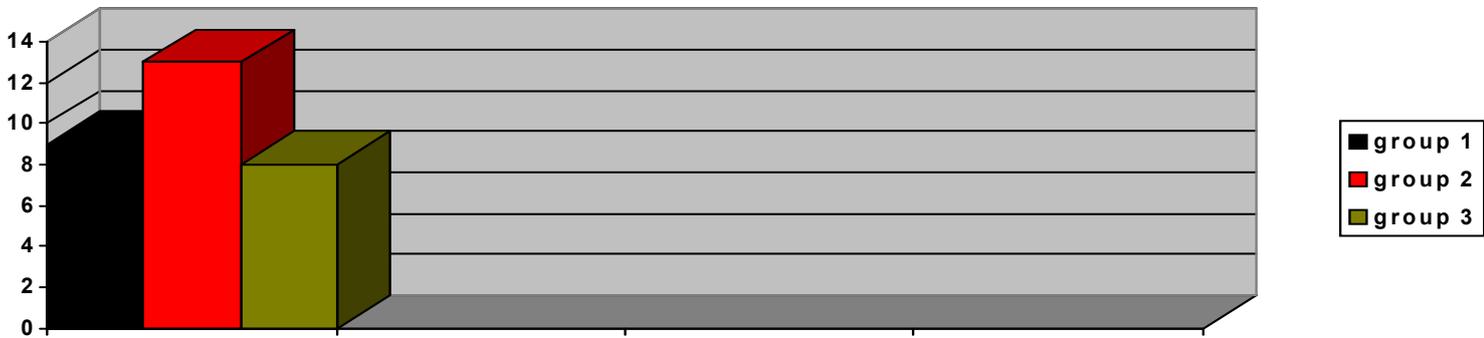


Figure 2: No. of patients according to age group

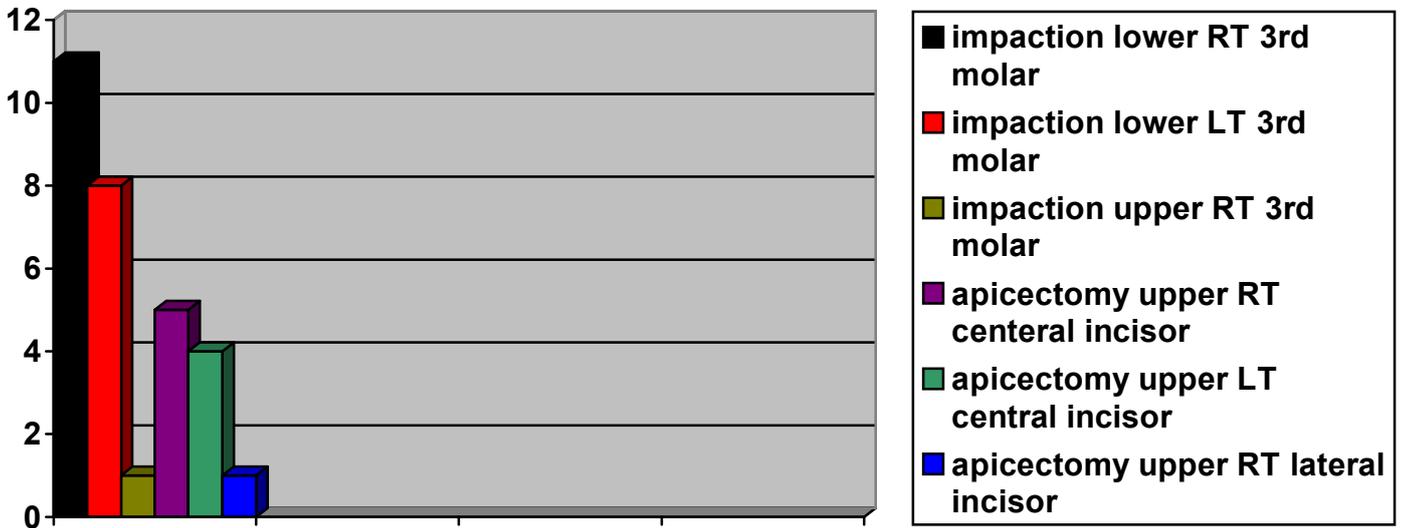


Figure 3 No. of patients according to surgical procedures



**Figure 4:** Apicectomy with periapical dental cyst enucleation for upper central incisor  
(Intra operative picture)

The patient has been given clindamycine 600 mg 1 hr. preoperatively (group 2)



**Figure 5:** Surgical removal of impacted lower 3<sup>rd</sup> molar (intra operative picture)

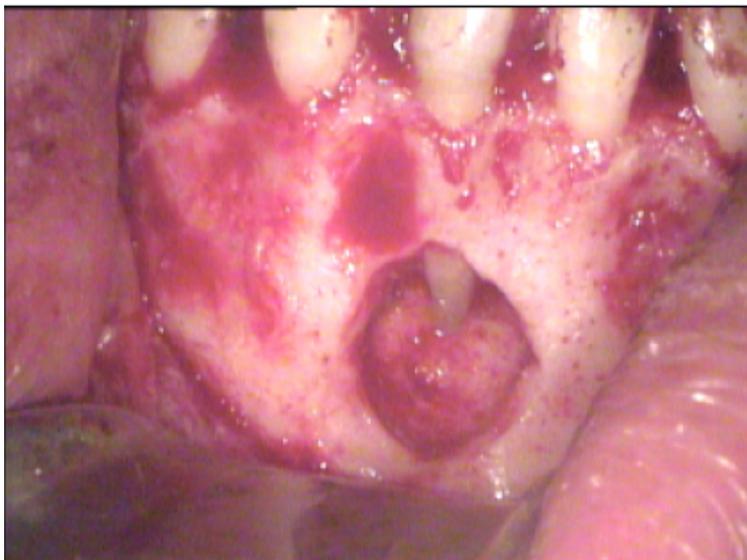
The patient has been given 1 million i.u. Procaine penicillin 30 minute pre operatively (group 1)



**Figure 6:** Postoperative picture (3<sup>rd</sup> postoperative day)For the site of operation  
(postoperative oedema subsided, no signs of infection noticed)



**Figure 7:** 21 years old female with extra oral sinus due to infected cyst associated with necrotic lower central incisor (pre operative picture), (group 2)



**Figure 8:** intra operative picture after the removal of the infected cyst. This patient has been given 600 mg Clindamycin 1 hr. pre operatively



**Figure 9:** Extra oral picture after one month of the operation shows the process of healing of the extra oral sinus