

The Effects of Dexamethasone on Postoperative Complications After Surgical Removal of Impacted Lower Third Molar Teeth

Haider Ali Rasul*, Ahmad Fliah Hassan**, Athil Adnan Raheem***, Hajer Ibrahim**

*Department of Oral and Maxillofacial surgery, College of Dentistry, Al-Mustansiriyah University, Baghdad, Iraq.

**Department of oral medicine and Oral Diagnosis, college of Dentistry, Al-Mustansiriyah University, Baghdad, Iraq.

*** Department of Oral and Maxillofacial surgery, Al-Karama specialized center for dentistry, Ministry of health.

Abstract:

The purpose of this study was to evaluate the effects of dexamethasone on postoperative complications after surgical removal of impacted lower third molar.

Sixty patients submitted for surgical removal of impacted lower third molar, thirty patients received dexamethasone ampoule I.M (8 mg/2 ml) one hour preoperatively followed by one ampoule 12 hours post operatively, compared with another thirty patients who did not receive dexamethasone. The parameters of comparison were swelling and trismus depending on the patient's outcome (Yes or No), in addition to pain using VAS scale. Findings were recorded at second, fourth, and seventh days postoperatively.

Dexamethasone appear to have great effect on reducing the post operative complications (pain, swelling and trismus) after the surgical removal of lower third molar and the statistical analysis showed a highly significant difference between group one that received dexamethasone and group two without dexamethasone.

We concluded that the dexamethasone was statistically more efficient in reducing the pain, swelling and trismus.

Keywords: dexamethasone, complications, impacted wisdom.

الخلاصة:

ان الهدف من هذه الدراسة هو بيان تأثير مادة الدكساميثازون على تقليل التأثيرات الجانبية (الألم، الورم والتشنج) الناتجة عن رفع ضرس العقل في الفك السفلي والتي من الممكن ان تؤثر على فعالية المريض سلبيًا. ستون مريضاً شاركوا في هذه الدراسة وتم توزيعهم على مجموعتين, المجموعة الاولى (30) مريضاً تم اعطائهم حقنة دكساميثازون 8 ملغم/2 مل في العضلة قبل العملية بساعة واحدة ثم حقنة ثانية بعد العملية باثني عشر ساعة. أما المجموعة الثانية (30) مريضاً فلم يتم اعطائهم هذه الحقنة. تمت المقارنة بين المجموعتين عن طريق متابعة (الألم، الورم والتشنج).

أظهرت الاختبارات الاحصائية أن المجموعة التي استخدم معهم الدكساميثازون كان (الألم، الورم والتشنج) اقل من الذين لم يستخدم معهم الدكساميثازون بشكل كبير.

Introduction:

One of the most common surgical procedures that is performed by the oral and maxillofacial surgeons is the surgical extraction of impacted teeth particularly the 3rd molars^[1,2]. The incidence of post-

operative complications associated with lower wisdom teeth extraction ranged from 2.6%-30.9%^[3].

A surgical procedures in the oral cavity is oftenly associated with swelling, pain, and trismus as a result of the

postoperative inflammatory response (hyperemia, vasodilatation, increased capillary permeability with fluid accumulation in the interstitial space and granulocyte and monocyte migration)^[1,4,5]. Extension of the incision as well as tissue manipulation and duration of surgery could affect the amount of these complications^[6,7,8].

When impacted third molars are removed, post-surgery is characterized by limitation in the mouth opening, pain, reduced masticatory capability and swelling of variable degree. The latter represents a serious issue as it affects the ability of the patient to interrelate and to return to the routine working life, especially during the first 3 days following oral surgery^[9,10].

Postoperative events (pain, trismus and swelling) are usually treated with pharmacological and/or various strategy interventions. To this purpose, different surgeons treat postoperative complications in the preoperative period or in the postoperative period or both. In some cases, even during surgery^[11,12].

Corticosteroids are known to reduce inflammation, fluid transudation and edema, there by this will reduce subsequently pain swelling and trismus^[13, 14]. Cortisol and the synthetic analogue of cortisol have the ability to interfere with the physiologic processes of inflammation and, thus, reduce the development of local fever, redness, swelling and tenderness by which inflammation is recognized^[15].

Another way is by controlling the synthesis of prostaglandins, which play a major role in the induction of pain, inflammation, and fever which leads to conversion of phospholipids to arachidonic acid by phospholipase A2, and the resultant production of leukotrienes, prostacyclins, prostaglandins and thromboxane A2, acting as mediators of the inflammatory response^[16,17,18,19].

Therefore, Cortisol and the synthetic analogue of cortisol represent the most efficacious anti-inflammatory agents and to this purpose can be used in several different conditions^[20]. However, important side effects may ably limit actions about their use with some patients^[21]. The mechanism of action of corticosteroids has been largely reviewed by several authors^[8, 21, 22, 23], and those that are preferentially utilized in dentoalveolar surgery include dexamethasone (administered orally), dexam-ethasone sodium phosphate (IV or IM), dexamethasone acetate (IM), methylprednisolone (orally), methyl-prednisolone acetate and methyl-prednisolone sodium succinate (IV or IM). Presently, betame-thasone has been used as well^[24, 25].

However, there are no definite protocols relative to different molecules or regimens, time and route of administration of cortisol^[26].

The objective of this study was to investigate the role of dexamethasone to reduce pain, trismus and swelling, which occur after surgical removal of impacted lower third molars by using dexamethasone injection (8mg/2ml) pre and post operatively.

Materials and Methods:

Study samples were composed of sixty Iraqi Patients attended the teaching hospital of the College of Dentistry, Al-Mustansiriya University and Alkarama specialized center for dentistry seeking treatment for impacted lower 3rd molar. Detail medical, dental history and a consent form were taken for each patient before performing the surgical procedure. The age range was (14-45 years) with mean of (24.916 years old).

All selected patients did not have history of any systemic diseases and were not on any medication. They were all subjected for radiographical examination by

using OPG and/or PA radiograph. The sample was divided into two equal groups. Patients in group one were given a dexamethasone injection (8mg) IM one hour before surgical procedure followed by another injection 12 hours postoperatively, while patients in group two did not receive steroid. The surgical procedures were carried out under local anesthesia (2% lidocaine with 1/80000 adrenalin) and the instruments (diagnostic and surgical) were well sterilized by hot air oven. Three sided flap was used for exploration of the impacted teeth, surgical handpiece was used for removal of bone and sometimes for tooth sectioning, normal saline (0.9 sodium chloride) was used for irrigation and cooling, then incisions were sutured using 3/0 black silk suture with cutting end needle, and all the patients covered by suitable antibiotics and analgesics.

The Pain, swelling and trismus were used as clinical parameters in the comparison between the two groups. The pain measured by using VAS scale while the swelling and trismus were measured by the patients themselves by using YES or NO answers (subjective criteria) after second, fourth and seventh days in special formula^[27]. (Figure-1)

The data after collection were statistically analyzed by using chi-square, ANOVA, and t-test for the comparison between the two groups.

Results:

From the result of descriptive statistics (mean) which exhibits that the pain in the 2nd, 4th and 7th days for group 1 is less than in group 2, (Table-1 & Figure-2) and this showed that the pain with dexamethasone group was less than that without dexamethasone group.

For testing significant difference between group one and group two ANOVA test and t-test showed significant variation

between days in the 1st group where P-value <0.01, F-test =55.7, also LSD show highly significant difference between 2nd, 4th days and 2nd, 7th days where p-value <0.01 while significant difference between 4th, 7th days where P-value=0.012 (Table-2. A, B)

In the 2st group P-value <0.01, F-test =131.5, and LSD show highly significant difference between 2nd, 4th days, 2nd, 7th days and 4th, 7th days where p-value <0.01 (Table-3. A, B)

The statistical comparison using t-test and P-Value showing highly significant difference between group 1 and group 2 in the 2nd, 4th and 7th days (12.5, 11.8, 7.5 and P<0.01) respectively. Table-4 indicates that dexamethasone has great effect on reducing pain after surgical extraction of the lower 3rd molar.

The statistical evaluation for the 2nd clinical parameter (swelling) exhibit that the percentage of swelling in the 1st group was highly decreased in the 2nd, 4th and 7th days (66.7%, 26.7% and 3.3%) respectively while in the 2nd group the percentage of the swelling dropped after the 4th days (2nd =100%, 4th =100% and 7th =36.7%) (Table-5 and Figure-3) which show that dexamethasone reduce swelling in group 1 better than group 2 without dexamethasone. The significant difference using Chi-square in (2nd, 4th and 7th days) shows significant difference on 2nd and 7th days, P-value= 0.001 and Chi-square= 12.0 and 10.0 respectively, while highly significant difference on the 4th days, P-value < 0.01 and Chi-square=34.7 (Table 6), and this predicted that dexamethasone reduced swelling greatly after surgical extraction of impacted lower 3rd molar.

In the 3rd clinical parameters (trismus) the percentage in the 1st group was highly decreased in the 2nd, 4th and 7th days (40%, 13.3% and 3.3%) respectively while in the 2nd group the percentage of trismus dropped more than 50% after 4th days (2nd

=100%, 4th =100% and 7th =46.7%) (Table-7, Figure-4), which indicate that patient in group1 with dexamethasone have less trismus than those in group2. The significant difference between group1 and group2 using Chi-square and p-value exhibit a highly significant difference in (2nd days, 4th days and 7th days) P-value< 0.01 and Chi-square= 25.7, 45.9 and 15.99 respectively (Table 8), from these results patients with dexamethasone showed less trisms than those without dexamethasone.

Discussion:

In this research the motto of the study was to obtain an ideal drug with optimum action and fewer side effects for reducing complications after surgical removal of impacted lower third molar that may embarrassed the patients and limit their activities.

Many studies have shown that pain decrease with dexamethasone, but a clear pathway for this effect has not been explained. The authors suggest that swelling made the tissue tense (trismus) and caused tension pain that was reduced when dexamethasone decreased the facial swelling^[28,29,30,31]. From our results there was a highly significant difference in pain, swelling and trismus between the two groups where dexamethasone decrease clearly pain, swelling and trismus in group 1 and this came in agreement with the results

of Boworn Klongnoi etal 2012^[32]. Also our study came in agreement with the study of José Leonardo Simone et, al. 2013^[33] where they found that dexamethasone decreased post surgical complications.

But our results disagree with the study of Ordulu M et, al. 2006^[34]. where there was a statistically significant difference in mouth opening on fifth and seventh days but none in facial swelling and pain between methylprednisolone group and plain group.

Also our study come in agreement with the study of Boworn Klongnoi et, al. 2012^[32]. which found that dexamethasone reduced the post surgical complications of impacted lower 3rd molars.

Again the agreement of our study came compatible with the study of Tiwana et, al. 2005^[35]. Which reported that data on patients undergoing surgery for extraction of four impacted molars; Patients were divided in two groups: the first group was administered with 8 mg desamethasone IV and the second one with 40 mg methylprednisolone IV.

It was concluded that preoperative administration of corticosteroids IV has a better outcome, even in the absence of antibiotic therapy, as suggested by 8% of patients with slight swelling versus 28% in the control untreated group.

Swelling:

	Trismus / days		
	2 nd	4 th	7 th
Yes			
No			

Trismus:

	Swelling / days		
	2 nd	4 th	7 th
Yes			
No			

Pain VAS

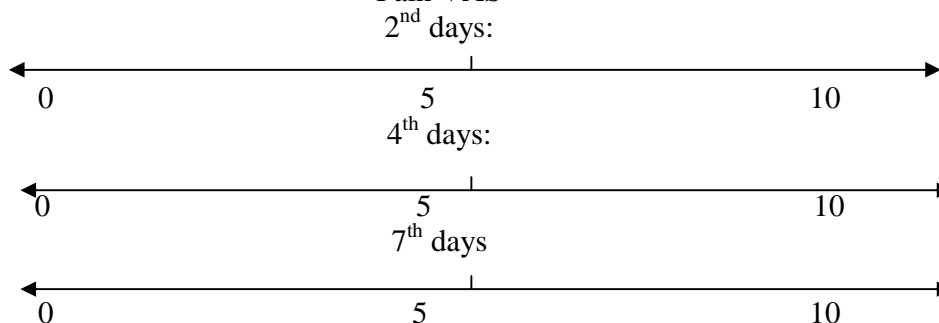


Figure-1: Clinical assessment:

Table-1: descriptive of Group-1 and Group-2 Pain VAS

	2 nd days	4 th days	7 th days
Mean/Group1	3.866667	1.8	1.1
SD	1.455864	1.030567	0.402578
Mean/Group2	8.16129	6.419355	2.483871
SD	1.4628	1.708297	0.961629

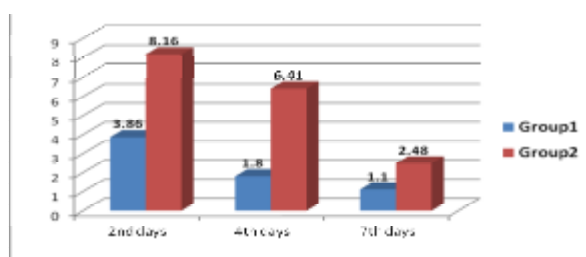


Figure-2. Descriptive of Group1 and Group2 Pain VAS

Table-2. A: ANOVA of group-1

	F-test	P-value
Between days	55.69	P<0.01 HS

*High significant

Table-2. B: LSD of group-1

	P-value	Sig
1&2	P<0.01	HS
1&3	P<0.01	HS
2&3	0.012	S*

*P<0.05 Significant. 1=2nd days, 2=4th days, 3=7th days.

Table-3. A: ANOVA of group-2

	F-test	P-value
Between days	131.49	P<0.01 HS

*High significant

Table-3.B: LSD of group2

	P-value	Sig
1&2	P<0.01	HS
1&3	P<0.01	HS
2&3	P<0.01	HS

*High significant. 1=2nd days, 2=4th days, 3=7th days

Table- 4: t-test between group1&2 of pain VAS

	2 nd days	4 th days	7 th days
T	12.469	11.756	7.49
P	P<0.01	P<0.01	P<0.01
Sig	HS	HS	HS

*High significant

Table-5: Number and percentage % of group-1 and 2 Swelling.

Group 1	2 nd days		4 th days		7 th days	
	No.	%	No.	%	No.	%
Yes	20	66.7	8	26.7	1	3.3
NO	10	33.3	22	73.3	29	96.7
Group 2						
Yes	30	100	30	100	11	36.7
NO	0	0	0	0	19	63.3

Table-6: Chi-square between group-1 and group-2 of Swelling

	2 nd days	4 th days	7 th days
Chi-square	12.01	34.73	10.01
P	0.001	P<0.01	0.001
Sig	S	HS	S

*P<0.05 Significant

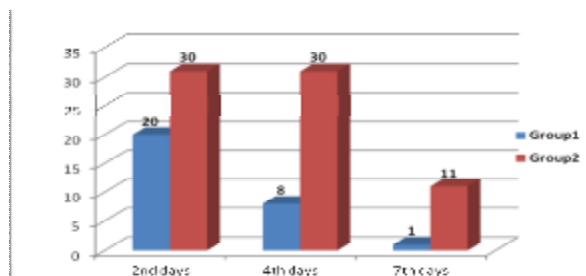


Figure-3: Number of group-1 and 2 Swelling.

Table-7: Number and percentage % of group-1 and 2 Trismus.

Group1	2 nd days		4 th days		7 th days	
	No.	%	No.	%	No.	%
Yes	12	40	4	13.3	1	3.3
NO	18	60	26	86.7	29	96.7
Group2						
Yes	30	100	30	100	14	46.7
NO	0	0	0	0	16	53.3

Table-8: Chi-square between group-1 and group-2 of Trismus.

	2 nd days	4 th days	7 th days
Chi-square	25.71	45.88	15.99
P	P<0.01	P<0.01	P<0.01
Sig	HS	HS	HS

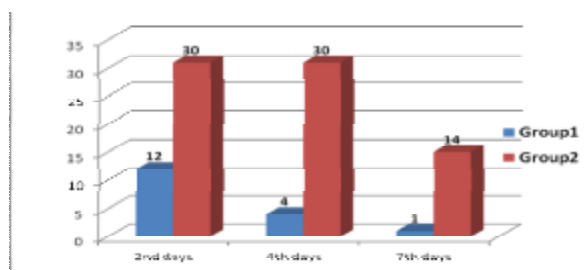


Figure- 4: Number of group1 & 2 Trismus

References:

- Omer, W. M. and Waseem, K. M. Effect of submucosal and intramuscular dexamethasone on postoperative sequelae after third molar surgery: comparative study British Journal of Oral and Maxillofacial Surgery, 2011. Vol. 49. Pp: 647–652. (IVSL)
- Shepherd, J. P. and Prickley, M. Surgical removal of 3rd molars. BMJ. 1994. 309. Pp: 620-621.
- François, B. and Nach, G. D. Extraction of Impacted Mandibular Third Molars: Postoperative Complications and Their Risk Factors, 2007. Vol. 73. No. 4.
- Messer, E. J. and Keller, J. J. The use of intraoral dexamethasone after extraction of mandibular third molars. Oral Surg, Oral Med, Oral Pathol. 1975. Vol. 40. Pp: 594–8.
- Beirne, O. R. and Hollander, B. The effect of methylprednisolone on pain, trismus, and swelling after removal of third molars. Oral Surg, Oral Med, Oral Pathol. 1986. Vol. 61. Pp: 134–8.
- Hupp, J. R. Wound repair. In: Peterson, L. J.; Ellis, E.; Hupp, J. R. and Tucker, M. R. Editors Contemporary oral and maxillofacial Surgery, 1998. 3rd ed. St Louis: Mosby. Pp. 58–60.
- Shevel, E.; Koepp, W. G. and Butow, K. W. A subjective assessment of pain and swelling following the surgical removal of impacted third molar teeth using different surgical techniques. SADJ. 2001. Vol. 56. Pp: 238–41.
- Kim, K.; Brar, P.; Jakubowski, J.; Kaltman, S. and Lopez, E. The use of corticosteroids and nonsteroidal anti-inflammatory medication for the management of pain and inflammation after third molar surgery: A review of the literature. Oral Surg, Oral Med, Oral Pathol, Oral Radiol Endod. 2009. Vol. 107. Pp: 630–40.

- 9- Colorado, B. M.; Valmaseda, C. E.; Berini, A. L. and Gay, E. C. Quality of life following lower third molar removal. *Int J Oral Maxillofac Surg.* 2006. Vol. 35. Pp: 343–7.
- 10- Slade, G. D.; Foy, S. P.; Shugars, D. A.; Phillips, C. and White, R. P. The impact of Third molar symptoms, pain, and swelling on oral health-related quality of life. *J Oral Maxillofac Surg.* 2004. Vol. 62. Pp: 1118–24.
- 11- Curran, J. B.; Kennett, S. and Young, A. R. An assessment of the use of prophylactic antibiotics in third molar surgery. *Int J Oral Surg.* 1974. Vol. 3. Pp: 1–6.
- 12- Kaczmarzyk, T.; Wichlinski, J.; Stypulkowska, J.; Zaleska, M.; Panas, M. and Woron, J. Single-dose and multi-dose clindamycin therapy fails to demonstrate efficacy in preventing infectious and inflammatory complications in third molar surgery. *Int J Oral Maxillofac Surg.* 2007. Vol. 36. Pp: 417–22.
- 13- Beirne, O. R. Evaluation dexamethasone for reduction of postsurgical sequelae of third molar removal. *J Oral Maxillofac Surg.* 1992. Vol. 50. Pp: 1182–3.
- 14- Patten, J. R.; Patten, J. and Hutchins, M. O. Adjunct use of dexamethasone in postoperative dental pain control. *Compendium.* 1992. Vol. 13. Pp: 580–584.
- 15- Ito, U.; Reulen, H. J.; Tomita, H.; Ikeda, J.; Saito, J. and Maechara, T. Formation and propagation of brain edema fluid around human brain metastases. *Acta Neurochirur (Wien).* 1998. Vol. 90. Pp: 35-41
- 16- Hirschman, J. V. Some principles of systemic glucocorticoid therapy. *Clin Exp Dermatol.* 1986. Vol. 11. Pp: 27-46.
- 17- Babatunde, O. B.; Jelili, A. A.; Wasiu, L. A.; Akinola, L. L.; Godwin, T. A. and Mobolanle, O. O. Effects of co-administered dexamethasone and diclofenac potassium on pain, swelling and trismus following third molar surgery Published: 07 November 2005 *Head & Face Medicine* 1:11 doi:10.1186/1746-160X-1-11. (IVSL)
- 18- vander Westhuijzen, A. J.; Roelofse, J. A.; Grotepass, F. W. and Becker, P. J. Randomized double-blind comparison of tiaprofenic acid and diclophenac sodium after third molar surgery. *Oral Surg Oral Med Oral Pathol.* 1994. Vol. 78. Pp: 557-566.
- 19- Jackson, D. L.; Moore, P. A. and Hargreaves, K. M. Preoperative nonsteroidal anti-inflammatory medication for the prevention of postoperative dental pain. *JADA,* 1989. Vol. 119. Pp: 641-647.
- 20- Holte, K. and Kehlet, H. Perioperative single-dose glucocorticoid administration: Pathophysiologic effects and clinical implications. *J Am Coll Surg.* 2002. Vol. 195. Pp: 694–711.
- 21- Goodman, L. S. and Gilman, A. G. *The pharmacologic basis of therapeutics.* 2005. 11th Ed. New York: Mcgraw-Hill.
- 22- Pedersen, A. Decadron phosphate in the relief of complaints after third molar surgery. *Int J Oral Surg.* 1985. Vol. 14. Pp: 235–40.
- 23- Dionne, R. A.; Gordon, S. M.; Rowan, J.; Kent, A. and Brahim, J. S. Dexamethasone suppresses peripheral prostanoid levels without analgesia in a clinical model of acute inflammation. *J Oral Maxillofac Surg.* 2003. Vol. 61. Pp: 997–1003.
- 24- Koerner, K. R. Steroids in third molar surgery: A review. *Gen Dent.* 1987. Vol. 35. Pp: 459–63.

- 25- Hooley, J. R. and Francis, F. H. Bethamethasone in traumatic oral surgery. *J Oral Surg.* 1969. Vol. 27. Pp: 398–403.
- 26- Francesco, S. and Marco, C. Strategies used to inhibit postoperative swelling following removal of impacted lower third molar *Dent Res J (Isfahan)*. 2011. Vol. 8 (4). Pp: 162–171.
- 27- Zeyad, F. Al-H. Evaluation of immediate implant placement in fresh extraction sockets with and without the use of frios aligpore (clinical and radiographical study). 2006.
- 28- Alexander, R. E. And Thronson, R. R. A review of perioperative corticosteroid use in dentoalveolar surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2000. Vol. 90. Pp: 406–15.
- 29- Grossi, G. B.; Maiorana, C.; Garramone, R. A.; Borgonovo, A.; Beretta, M.; Farronato, D. and Santoro, F. Effect of submucosal injection of dexamethasone on postoperative discomfort after third molar surgery: a prospective study. *J Oral Maxillofac Surg.* 2007. Vol. 65. Pp: 2218–26.
- 30- Schmelzeisen, R. and Frölich, J. C. Preventive of postoperative swelling and pain by dexamethasone after operative removal of impacted third molar teeth. *Eur J Clin Pharmacol.* 1993. Vol. 44. Pp: 275-7.
- 31- Pedersen, A. Decadron phosphate in the relief of complaints after third molar surgery. A double-blind, controlled trial with bilateral oral surgery. *Int J Oral Surg.* 1985. Vol. 14. Pp: 235– 40.
- 32- Boworn, K.; Pariya, K.; Kiatanant, B. and Natthamet, W. Effect of single dose preoperative intramuscular dexamethasone injection on lower impacted third molar surgery. *Int. J. Oral Maxillofac. Surg.* 2012. Vol. 41. Pp: 376–379. International Association of Oral and Maxillofacial Surgeons. Published by Elsevier Ltd. All rights reserved. (IVSL)
- 33- José, L. S.; Waldyr, A. J. and Anna, C. R. Original Articles Comparative analysis of preemptive analgesic effect of dexamethasone and diclofenac following third molar surgery *Discipline of Integrated Clinical Dentistry, (Braz. oral res., ahead of print Epub 19-Abr-2013.* <http://dx.doi.org/10.1590/S180683242013005000012>)
- 34- Ordulu, M.; Aktas, I.; Yalcin, S.; Azak, A. N.; Evlioğlu, G.; Disçi, R. and Emes, Y. Comparative study of the effect of tube drainage versus methylprednisolone after third molar surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2006. Vol. 101(6). Pp: e96-100.
- 35- Tiwana, P. S.; Foy, S. P.; Shugars, D. A.; Marciani, R. D.; Conrad, S. M. and Phillips, C. The impact of intravenous corticosteroids with third molar surgery in patients at high risk for delayed health-related quality of life and clinical recovery. *J Oral Maxillofac Surg.* 2005. Vol. 63. Pp: 55–62.