



## Submucosal administration of dexamethasone versus methyl prednisolone in management of postoperative sequelae after mandibular third molar impaction - A systematic review

Janani Kandamani<sup>\*</sup>, Divya Sanjeevi Ramakrishnan, Sudarssan Subramaniam Gouthaman, Santhosh Kumar M P

Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, No 162, Poonamallee High Road, Vellappanchavadi, Chennai-600077, Tamil Nadu, India

### Article History:

Received on: 01 Jun 2020  
Revised on: 02 Jul 2020  
Accepted on: 03 Jul 2020

### Keywords:

Dexamethasone,  
Methyl prednisolone,  
Submucosal,  
Third molars,  
Swelling,  
Pain

### ABSTRACT

Third molar extraction is one of the most commonly performed minor surgical procedure in any dental practice worldwide, often accompanied by various postoperative sequelae such as swelling pain and trismus which intern affects the quality of life of a patient. Over the past few decades, different methods have been proposed in the literature and were clinically evaluated to reduce the postoperative discomfort after mandibular third molar impaction and out of which corticosteroids, have shown promising results. Dexamethasone (administered either orally, submucosally, IV or IM), methylprednisolone acetate and methylprednisolone sodium succinate (IV or IM or submucosal) are most commonly preferred corticosteroids in oral and maxillofacial surgery. The main objective is to systematically review the comparison of the effectiveness of submucosal administration of dexamethasone with methylprednisolone following mandibular third molar impaction in reducing the postoperative sequelae, and its discomfort and searches were performed in the PubMed, Medline, Scopus, and Cochrane Library databases. Two articles were most relevant, and the results of the comparison of the selected articles were analysed. From this deliberate audit, it is very well may be inferred that submucosal injection of dexamethasone plays a promising role in reducing the postoperative sequelae which includes swelling, pain and trismus and its discomfort following mandibular third molar impaction when compared with that of methylprednisolone.



### \*Corresponding Author

Name: Janani Kandamani  
Phone: +91- 95662-55481  
Email: [jananikandamani@gmail.com](mailto:jananikandamani@gmail.com)

ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11i3.2674>

Production and Hosted by

Pharmascope.org

© 2020 | All rights reserved.

### INTRODUCTION

The prophylactic or therapeutic, mandibular third molar surgery, is one of the most commonly performed minor surgical procedure in dental surgery (McGrath *et al.*, 2003b; Kumar *et al.*, 2010). This procedure inevitably results in trauma to hard and soft tissues; consequently, frequent postoperative complications of mandibular third molar impaction such as significant swelling, pain, and reduced inter incisal distance may be experienced by patients which diminishes their quality of life (Bamgbose *et al.*, 2005; Worrall *et al.*, 1998).

Patients quality of life after oral surgical procedures

has been discussed in various medical and social science literature over the past few decades (Grossi *et al.*, 2007). The quality of life has and is usually considered as a patient's impression of his situation in life, which is the impact of the disease and treatment (Buyukkurt *et al.*, 2006; McGrath *et al.*, 2003a). Maxillofacial surgeons, should be committed enough to render better control of this postoperative sequelae and discomfort for patients undergoing third molar impaction procedure (Ogden *et al.*, 1998).

Different techniques have been proposed in the literature to control the postoperative swelling, of which corticosteroids have been broadly utilised in an oral and maxillofacial medical procedure to control inflammation and the associated symptoms of third molar impaction procedure for several decades (Doward and McKenna, 2004; Kaplan, 2003). The anti-inflammatory action of corticosteroids has been used to lessen oedema instigated by the surgery; however, their immediate effects on the control of pain and trismus are still controversial (Esen *et al.*, 1999).

Corticosteroids are a group of drugs which have identical chemical formula as steroidal hormones which are secreted by the adrenal gland. These hormonal steroids based on their biological effects are classified as glucocorticoids and mineralocorticoids (Zandi, 2012). A large number of steroids are released into the circulation by the adrenal gland, and two are of greater importance are aldosterone, which is a mineralocorticoid, and cortisol, which is a glucocorticoid. Dexamethasone (administered either orally, submucosally, IV or IM), methylprednisolone acetate and methylprednisolone sodium succinate (IV or IM or submucosal) are most commonly preferred corticosteroids in oral and maxillofacial surgery. These corticosteroids decrease the postoperative sequelae of mandibular third molar impaction procedure in many patients and therefore, decrease the morbidity and improve the personal satisfaction of the patient by reducing the discomfort following the procedure (Aditya and Sanghavi, 2015; Fonseca *et al.*, 2009). To our knowledge this is the first article to systematically review the comparison of the effectiveness of submucosal administration of dexamethasone with methylprednisolone following mandibular third molar impaction in reducing the postoperative sequelae and its discomfort.

## MATERIALS AND METHODS

### Structured question

Is submucosal administration of dexamethasone

better at controlling postoperative sequelae compared to submucosal administration of methylprednisolone in patients undergoing mandibular third molar impaction procedure?

### PICO analysis

Population: Patients undergoing mandibular third molar impaction procedure

Intervention: Submucosal dexamethasone

Comparison: Submucosal methylprednisolone

Outcome: Postoperative control of pain, swelling and trismus are the variables of interest as shown in Table 1.

### Source and Search strategy

The online databases, including Medline, PubMed central and advanced indexes, were last searched until December 2019. Clinical studies and review bibliographies are identified in the online search and were analysed. Also, a hand search of various journals was done. A search strategy was based on English language journals only. Reference list of the reviews and the identified studies were also checked for possible additional studies.

### Selection Criteria

This systematic review sought to assess the randomised clinical studies comparing the effect of the dexamethasone versus methylprednisolone through submucosal administration after mandibular third molar impaction procedure performed in humans.

### Inclusion Criteria

All randomised controlled trials of patients of age higher than 16 years having lower third molars indicated for impaction, based on the structured research question were involved in this review.

### Exclusion Criteria

Case reports, case series, animal studies, in vitro studies, retrospective studies, review articles, articles from other languages and studies comparing different routes of administration of corticosteroid drug were excluded.

### Types of Outcome Measure

Control of postoperative pain, oedema and trismus

All the articles included in this systematic review were subjected to methodological quality assessment and risk of bias was evaluated.

## RESULTS

Forty-eight articles were obtained from the electronic search utilising the keywords, and two articles were yielded from hand search. Finally, two

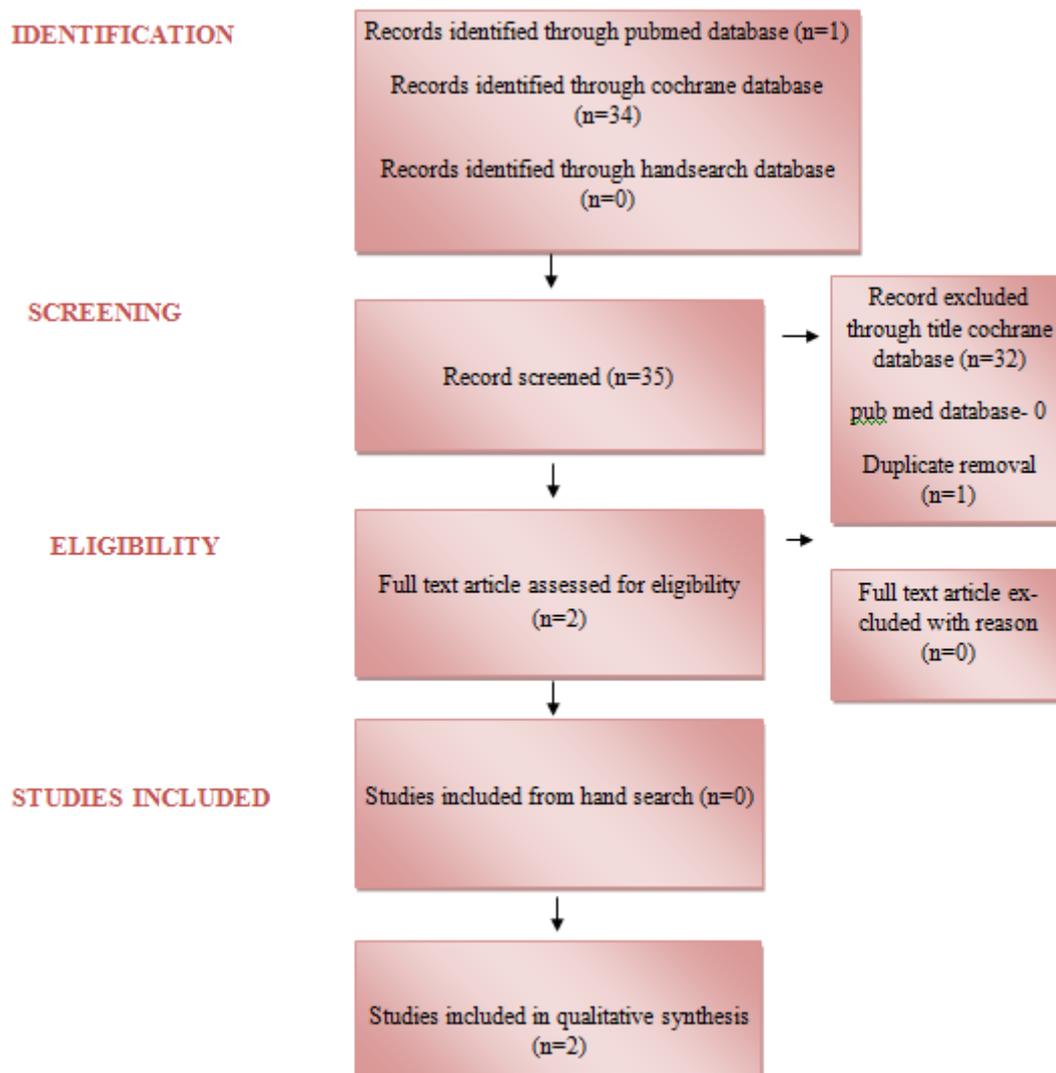


Chart 1: Flow Chart - 1

**Table 1: Variables of interest**

S.No	Variables of interest
1.	Post-operative pain
2.	Post-operative swelling
3.	Post-operative mouth opening

articles satisfied the inclusion criteria and were analysed in this systematic review, as seen in Chart 1. One study was obtained by electronic literature search, and one article from hand search was included. Two independent examiners evaluated these two articles according to the inclusion criteria. General information and characteristics of selected articles were tabulated in Table 2, Table 3 and Table 4. Sample size, level of evidence of article, type of impaction done, mean age group, gender, a dosage of drugs were analysed. Mean age

group included in both the clinical trial was around 25-50 years, and mandibular third molar impaction procedure was performed in both the articles. Both the included article has a placebo group, dexamethasone group and methylprednisolone group. Corticosteroid drug was administered submucosally pre-operatively, one article has analysed the results using 4mg dexamethasone, and other article had 8mg dexamethasone compared with 40 mg methylprednisolone in both reports. Mean duration of the impaction procedure was around 20-35 min approx-

**Table 2: General information and characteristics of selected articles**

S. No	Author and year	Title of article	Study design	Level of evidence (2016)	Sample Size
1	(Chugh <i>et al.</i> , 2018)	Submucosal injection of dexamethasone and methylprednisolone for the control of post operative sequelae after third molar surgery: randomized controlled trial.	Randomised controlled trial - In vivo study	Level 1b	60
2	(Lim and Ngeow, 2017)	A Comparative Study on the Efficacy of Submucosal Injection of Dexamethasone Versus Methylprednisolone in Reducing Postoperative Sequelae After Third Molar Surgery	Randomised controlled trial - In vivo study	Level 1b	65

**Table 3: General information and characteristics of selected articles**

Author and year	Control group	Intervention Groups		Jaw	Mean age and gender	Impaction type (pell and Gregory)
	Placebo group	Group 1	Group 2			
(Chugh <i>et al.</i> , 2018)	Saline	Dexamethason	methyl prednisolone	Mandible	Mean Age- 29.7 yrs M- 38 yrs F- 22 yrs	Class 1, 2, or 3 and position A or B
(Lim and Ngeow, 2017)	Saline	Dexamethason	methyl prednisolone	Mandible	Mean Age- 25yrs M- 11 yrs F- 49 yrs	Class II or position B

**Table 4: General information and characteristics of selected article**

Author and year	Variables of interest	No of pt per group	Mean duration of surgery	Time of administration of the drug	Dexamethaso	Methyl prednisolone
(Chugh <i>et al.</i> , 2018)	Assessment of post operative sequelae of third molar surgery	CG -17 IG 1-23 IG 2-20	20.2 min	Prior to the procedure	8mg	40mg
(Lim and Ngeow, 2017)	Assessment of post operative sequelae of third molar surgery	CG -20 IG 1-20 IG 2-20	20-35 min	10 min prior to the procedure	4mg	40mg

**Table 5: Methodology**

Author and year	Outcome	Other finding	Method of assessment of swelling, Pain and Trismus
(Chugh <i>et al.</i> , 2018)	Submucosal injection of dexamethasone was found to be superior to methylprednisolone only in terms of the reduction in swelling.	QOL was minimally affected in patients administered dexamethasone as compared to methylprednisolone and control subjects.	Facial swelling was measured with silk thread using four reference points: tragus, pogonion (inferior most point on the midline of the chin), gonion (angle of the mandible), and the corner of the mouth. It was calculated as the sum of the two diagonals made between these reference points. Pain - VAS score; Trismus -Inter- Incisal distance
(Lim and Ngeow, 2017)	Single preoperative dose of dexamethasone versus methylprednisolone was equally effective in reducing postoperative swelling and trismus. Pain control by these corticosteroids, however, was variable.	Wound healing in all patients from the 3 groups was uneventful. During assessment, all the surgical sites were pain free	Facial swelling measurements were taken as the sum of the length of 2 lines along the predetermined facial reference points from the outer corner of the eye to the angle of the mandible and from the tragus of the ear to the corner of the mouth Pain - VAS score; Trismus -Inter- Incisal distance

imately. Methodology and assessment of the outcome results are tabulated in Table 5, Table 6 and Table 7, respectively. Also, both the articles experience a moderate risk of bias, as seen in table Table 8 and Table 9.

## DISCUSSION

Around the age range of 18–30 years, where an individual undergoes both personal and professional growth, third molars usually erupt. Out of various corticosteroids, dexamethasone and methylprednisolone are the most common ones used in oral surgery and literature are filled with multiple studies on comparing these two drugs (Glick, 1989; GP, 1989). Also submucosal route of administration has become one of the easiest and safest ways of administration of a drug (Beirne and Hollander, 1986; Tiwana *et al.*, 2005). A series of postoperative sequelae associated with functional and structural alterations are usually seen following third molar impaction procedure which in turn affects the quality of life of patients for the initial few days after surgery (Messer and Keller, 1975; Moore *et al.*,

2005). Pain also lies upon a few different factors, for example, injury to tissues during surgery, individual's torment edge and mental prosperity (Tripathi, 2013; Seymour *et al.*, 1999). Inflammation and trismus go hand in hand as it is considered that one of the many factors leading to reduced interincisal distance after a third molar impaction procedure is inflammation but decreased mouth opening may also result in pain from the masticatory muscle exhibiting its inhibitory effect, due to its proximity to the surgical site (Valeriani *et al.*, 1999). Several different components that may worsen the postoperative discomfort includes lengthened time taken for surgery, traumatic extraction and accidental local anaesthetic injection into the masticatory muscle. These acts as a confounding factor of the clinical studies reviewed here (Romaniello *et al.*, 2000). Submucosal administration of dexamethasone is most efficient when given systemically as it contributes to an increased drug concentration at the site of surgery. It represents a straightforward, simple to use and practical treatment option in contrast to other treatment modalities (Chugh *et al.*,

**Table 6: Assessment of post operative swelling, pain and trismus**

	Sample and groupings	Post op swelling Day 2 p value	Post op swelling Day 7 P value	Interpretation of swelling
(Chugh <i>et al.</i> , 2018)	Placebo Dexamethasone Methylprednisolone	0.382 0.028 0.428	0.309 0.943 0.201	A statistically significant difference in swelling was found between the Dexamethasone group and the Methyl prednisolone group (P = 0.022)
(Lim and Ngeow, 2017)	NR	NR	NR	Patients who received dexamethasone injections showed significantly increased facial swelling on POD 2 when compared with POD 1 (P = .041, Wilcoxon rank test)

**Table 7: Assessment of post operative swelling, pain and trismus**

Author and year	Total VAS score Mean P value	Interpretation of pain	Post op day 2 Reduction in mouth opening P value	Interpretation of limited mouth opening
(Chugh <i>et al.</i> , 2018)	0.036 0.092 0.874	There was a statistically significant difference in total VAS score between the placebo group and the DM group (P = 0.036)	0.002 0.070 0.389	A reduction in mouth opening was noted on day 2 postoperative in all of the groups, with a statistically significant difference between the placebo group and the DM group (P = 0.002).
(Lim and Ngeow, 2017)	NR	The methylprednisolone group reported a significantly lower VAS score than the control group on POD 1 and POD 2	NR	The difference in efficacy between the 2 corticosteroid groups, however, was not statistically significant

**Table 8: Risk of Bias - Major and Minor Criteria**

S. No	Author and year	Randomisation	Allocation concealment	Assessor Blinding	Dropouts described
1	(Chugh <i>et al.</i> , 2018)	Yes	Yes	No	No
2	(Lim and Ngeow, 2017)	Yes	Yes	Yes	No

**Table 9: Risk of Bias - Major and Minor Criteria**

Author and year	Sample justified	justification	Baseline comparison	I/E criteria	Method error
(Chugh <i>et al.</i> , 2018)	No		Yes	Yes	No
(Lim and Ngeow, 2017)	No		Yes	Yes	No

2018; Lim and Ngeow, 2017).

Corticosteroid administration has been related in various studies for a reduction in postoperative third molar impaction procedure complications. However, deviation in the drug dosing and route of administration of corticosteroid drugs persists (Hafez *et al.*, 2014). Thus, dexamethasone and methylprednisolone have proved to be a successful alternative for lessening postoperative discomfort after third molar impaction procedure to a certain degree, independent of the course, and the timing of drug administration. Up until now, there have been two studies embraced to analyse the viability of dexamethasone versus methylprednisolone administered submucosally in reducing the postoperative sequelae of third molar impaction procedure.

Implications for evidence-based practice from this systematic review is that dexamethasone is more efficient in controlling oedema and trismus as compared to methylprednisolone. But both drugs have similar pain controlling ability. But the age of the patient, morphology of the tooth and amount of bone covering the tooth as well as surgeon skill should also be taken into consideration. Further studies are needed to be undertaken, which include all parameters mentioned above to establish this fact.

## CONCLUSION

Submucosal injection of dexamethasone diminishes the signs and manifestations markedly resulting from third molar impaction procedure. It appears that the potential analgesic effect of corticosteroids, if proved with proper randomised controlled trials with higher sample size, possess a guarantee to enhance their future compliance of the drug into a routine dental practice, despite the fact of remaining controversial and debatable.

## ACKNOWLEDGEMENT

The authors are grateful to the professor and Head of the department of oral and maxillofacial surgery for his guidance in this research work.

## Funding Support

No source of funding.

## Conflict of Interest

None of the authors declare any conflicts of interest.

## REFERENCES

- Aditya, A., Sanghavi, J. 2015. Applications of Corticosteroids in Dentistry. *Journal of Dental and Allied Sciences*, 4(1):19-19.
- Bamgbose, B. O., Akinwande, J. A., Adeyemo, W. L., Ladeinde, A. L., Arotiba, G. T., Ogunlewe, M. O. 2005. Effects of co-administered dexamethasone and diclofenac potassium on pain, swelling and trismus following third molar surgery. *Head & Face Medicine*, 1(1):11-11.
- Beirne, O. R., Hollander, B. 1986. The effect of methylprednisolone on pain, trismus, and swelling after removal of third molars.
- Buyukkurt, M. C., Gungormus, M., Kaya, O. 2006. The Effect of a Single Dose Prednisolone With and Without Diclofenac on Pain, Trismus, and Swelling After Removal of Mandibular Third Molars. *Journal of Oral and Maxillofacial Surgery*, 64(12):1761-1766.
- Chugh, A., Singh, S., Mittal, Y., Chugh, V. 2018. Submucosal injection of dexamethasone and methylprednisolone for the control of postoperative sequelae after third molar surgery: randomized controlled trial.
- Doward, L. C., McKenna, S. P. 2004. Defining Patient-Reported Outcomes. *Value in Health*, 7:S4-S8.

- Esen, E., Taşar, F., Akhan, O. 1999. Determination of the anti-inflammatory effects of methylprednisolone on the sequelae of third molar surgery. *Journal of Oral and Maxillofacial Surgery*, 57(10):1201–1206.
- Fonseca, R. J., Marciani, R. D., Turvey, T. A. 2009. Oral and maxillofacial surgery. Second edition. Saunders.
- Glick, M. 1989. Glucocorticosteroid replacement therapy: A literature review and suggested replacement therapy. *Oral Surgery, Oral Medicine, Oral Pathology*, 67(5):614–620.
- GP, M. 1989. *The nomenclature of steroids. Recommendations*, 186:429–458.
- Grossi, G. B., Maiorana, C., Garramone, R. A., Borgonovo, A., Beretta, M., Farronato, D., Santoro, F. 2007. Effect of Submucosal Injection of Dexamethasone on Postoperative Discomfort After Third Molar Surgery: A Prospective Study. *Journal of Oral and Maxillofacial Surgery*, 65(11):2218–2226.
- Hafez, A. G., Elsharrawy, E. A., Abdelmabood, A. A. 2014. Comparative study between methylprednisolone and dexamethasone as submucosal injection for control of edema, trismus and pain of third molar surgery. *Basic Research Journal of Medicine and Clinical Sciences*, 3:55–61.
- Kaplan, R. M. 2003. The significance of quality of life in health care. *Quality of Life Research*, 12(1):3–16.
- Kumar, V., Abbas, A. K., Fasuto, N., Aster, J. C. 2010. Robbins and Cotran Pathologic Basis of Disease. Philadelphia, PA. Saunders Elsevier. (8th edtn). Philadelphia, PA: Saunders Elsevier.
- Lim, D., Ngeow, W. C. 2017. A Comparative Study on the Efficacy of Submucosal Injection of Dexamethasone Versus Methylprednisolone in Reducing Postoperative Sequelae After Third Molar Surgery. *Journal of Oral and Maxillofacial Surgery*, 75(11):2278–2286.
- McGrath, C., Comfort, M. B., Lo, E. C., Luo, Y. 2003a. Patient-centred outcome measures in oral surgery: validity and sensitivity. *British Journal of Oral and Maxillofacial Surgery*, 41(1):43–47.
- McGrath, C., Comfort, M. B., Lo, E. C. M., Luo, Y. 2003b. Changes in life quality following third molar surgery – the immediate postoperative period. *British Dental Journal*, 194(5):265–268.
- Messer, E. J., Keller, J. J. 1975. The use of intraoral dexamethasone after extraction of mandibular third molars.
- Moore, P. A., Brar, P., Smiga, E. R., Costello, B. J. 2005. Preemptive rofecoxib and dexamethasone for prevention of pain and trismus following third molar surgery.
- Ogden, G. R., Bissias, E., Ruta, D. A., Ogston, S. 1998. Quality of life following third molar removal: a patient versus professional perspective. *British Dental Journal*, 185(8):407–410.
- Romaniello, A., Cruccu, G., McMillan, A. S., Arendt-Nielsen, L., Svensson, P. 2000. Effect of experimental pain from trigeminal muscle and skin on motor cortex excitability in humans. *Brain Research*, 882(1-2):120–127.
- Seymour, R. A., Meechan, J. G., Yates, M. S., Seymour, R. A., Walton, J. G. 1999. Pharmacology and dental therapeutics. pages 179–196. Oxford University Press. Oxford University.
- Tiwana, P. S., Foy, S. P., Shugars, D. A., Marciani, R. D., Conrad, S. M., Phillips, C., White, R. P. 2005. The impact of intravenous corticosteroids with third molar surgery in patients at high risk for delayed health-related quality of life and clinical recovery. *Journal of Oral and Maxillofacial Surgery*, 63(1):55–62.
- Tripathi, K. 2013. Essential of Medical Pharmacology. Jaypee Brothers Medical.
- Valeriani, M., Restuccia, D., Lazzaro, V. D., Oliviero, A., Profice, P., Pera, D. L., Saturno, E., Tonali, P. 1999. Inhibition of the human primary motor area by painful heat stimulation of the skin. *Clinical Neurophysiology*, 110(8):1475–1480.
- Worrall, S. F., Riden, K., Haskell, R., Corrigan, A. M. 1998. UK National Third Molar project: the initial report. *British Journal of Oral and Maxillofacial Surgery*, 36(1):14–18.
- Zandi, M. 2012. The Role of Corticosteroids in Today's Oral and Maxillofacial Surgery. *Glucocorticoids - New Recognition of Our Familiar Friend. InTech*.