Comparison of Efficacy of Methylprednisolone Injection into Masseter Muscle Versus Gluteal Muscle for Surgical Removal of Impacted Lower Third Molar

Loganathan Selvaraj · Srinivasan Hanumantha Rao ·
Arathy S. Lankupalli

Received: 4 April 2013 / Accepted: 16 July 2013 / Published online: 2 August 2013
© Association of Oral and Maxillofacial Surgeons of India 2013

Abstract

Purpose To compare the efficacy, advantages and disadvantages of the use of preoperative injection of methylprednisolone into masseter muscle versus gluteal muscle to minimize postoperative swelling after the surgical removal of lower third molar.

Materials and Methods A prospective randomized study was planned comprising of 10 subjects, undergoing elective surgery for bilateral impacted lower third molar removal with similar severity index. The subjects were randomly assigned into two groups—group I who received intrabuccal masseteric injection and group II who received gluteal injection of 40 mg of methylprednisolone after inferior alveolar nerve and long buccal nerve block (prior to the surgical removal of the impacted lower third molars). We evaluated the postoperative pain, trismus, swelling, advantages and disadvantages of the injection techniques. Statistical analysis was done using student *t* test.

Results Ten patients of mean age 27 ± 6 years were selected for the study including six males and four females. The mean age was 27 years (SD 6). The differences in

measurements of preoperative and postoperative pain, swelling and mouth opening between group I and group II were not statistically significant.

Conclusion The study evidently proves that there is no statistically significant difference between the intrabuccal approach of masseteric injection and gluteal injection of methylprednisolone in terms of pain, swelling and trismus following surgical removal of impacted lower third molars. However, the intrabuccal approach of masseteric injection was found to be more convenient when compared to gluteal injection, for the surgeon as well as the patient. It also has an additional advantage of being a painless steroidal injection on an anesthetized injection site.

Keywords Steroids · Masseter muscle · Gluteal muscle and impacted third molar

Introduction

The surgical practice of impacted teeth removal is closely associated with pain, swelling and trismus and there is always a need to minimize the postoperative pain and swelling which is commonly done by injecting steroids. Corticosteroids were first used as anti-inflammatory agents in oral surgery by Streen et al. [1] and in 1952 Spies et al. used hydrocortisone as anti-inflammatory mediator to decrease the fluid transudation and edema in dental surgeries [1–3]. The anti-inflammatory effects of glucocorticoids are due to their inhibitory effect on release of cytokines by preventing the movement of NF- κ B to the nucleus and additionally by inhibition of phospholipase A2. This reduces release of arachidonic acid from tissue phospholipids and decreases the formation of thromboxane, leukotrienes, prostacyclin and prostaglandins [4]. The glucocorticoids,

L. Selvaraj (✉)
Department of Oral and Maxillofacial Surgery, Saveetha Dental
College and Hospital, No-162, Ponnammalle High Road,
Chennai 600077, Tamil Nadu, India
e-mail: drloganathans@gmail.com

S. Hanumantha Rao
Department of Oral and Maxillofacial Surgery, Priyadarshini
Dental College and Hospital, Thiruvallur, India

A. S. Lankupalli
Department of Oral and Maxillofacial Medicine, Saveetha
Dental College and Hospital, No-162, Ponnammalle High Road,
Chennai 600077, Tamil Nadu, India
e-mail: scorpionsrini@gmail.com

especially methyl prednisolone was found to be effective as an anti-inflammatory mediator in surgical procedures and is commonly used to reduce the swelling associated with the surgical removal of impacted third molars [5–12].

Further, the site of injection has a significant influence on the effectiveness of surgical procedures encountered by the patient in terms of pain, swelling and trismus. The site of injection (i.e.; proximal or distal to the site of surgical operation) can also determine the efficacy of the injection. In the present study an attempt has been made to evaluate the postoperative pain, swelling and trismus in two groups of patients, one receiving 40 mg methylprednisolone injection on the masseteric site and the other receiving the same on the gluteal site. The comparison of efficacy and other advantages and disadvantages of the two injection sites were analyzed statistically and the effective painless injection site was evaluated.

Materials and Methods

A randomized prospective study was planned to be conducted amongst 10 subjects who reported to our department (10 patients with left and right impacted teeth, accounting for 20 samples) between February 2010 and March 2011. The inclusion criteria comprised of healthy patients with ASA I grade without contraindication for corticosteroids, having bilateral impacted lower third molars with similar difficulty index. Radiograph reports showed symmetrical positioning of the teeth. All patients required tooth section to remove it. (Similar difficulty index score of the impacted teeth on both the sides in the patient was ensured). The study was approved by the Institutional ethics committee and informed consent was obtained from all patients for extraction and methylprednisolone injection.

All the patients underwent bilateral surgical removal of impacted lower third molars on two different occasions. These patients were randomized into two groups, based on site of methylprednisolone injection (Melpred injection 40 mg vial, Cipla, Indian company), group I received masseteric injection and group II received gluteal injection. Both the groups received steroidal injections after inferior alveolar, lingual and

long buccal nerve block but before placing the incision. Further, to avoid technical bias, one surgeon performed all the surgical removals of the impacted lower third molars under lidocaine 2 % with adrenaline. After completion of the procedure, the patient was asked to rate his pain on a 100-mm visual analog scale, with zero representing 'no pain' and hundred representing 'worst pain'. Assessment of pain was done hourly for the first 6 h following the completion of the surgery, which was taken into single average data and then at intervals of 12 h for the next 3 days.

Mouth opening was measured with Caprovich callipers and postoperative swellings were evaluated by measuring the distance between tragus-lip commissure, gonion-lip commissure and gonion-external canthus of the eye using surgical silk thread. These measurements were also done by another investigator besides the operating surgeon on preoperative and postoperative second and seventh days.

Comparisons of mean pain intensity scores and mean measurements of swelling and mouth opening between groups I and II were performed using student's *t* test.

Results

Of the twelve patients selected for the study, two were excluded because of failure to report for subsequent reviews ($n = 20$; 10 patients with left and right impacted teeth, accounting for 20 samples). The preoperative data of mouth opening and facial swelling are presented in Table 2. The postoperative data of mean pain intensity scores, mouth opening and facial swelling measurements are showed in Tables 1, 3 and 4 respectively. The results indicate no statistically significant difference in all the three parameters evaluated between the two study groups and it can be conveniently stated that the two sites of injection had no difference in postoperative data.

Discussion

The administration of steroids effectively reduces facial swelling, pain and trismus following surgical extraction of

Table 1 Postoperative pain score

	Six hours (average)	Day one		Day two		Day three	
		Morning	Night	Morning	Night	Morning	Night
Masseteric injection (group I)	13.65	10.43	13.22	12.34	13.44	11.87	10.29
Gluteal injection (group II)	13.97	10.87	13.98	11.96	14.27	12.76	10.73
Difference of mean (group I–group II)	−0.32	−0.44	−0.76	0.38	−0.83	−0.89	−0.44
SD	0.779	0.635	0.980	1.003	0.956	1.255	1.001
<i>p</i> value	0.545	0.427	0.104	0.548	0.183	0.205	0.372

Table 2 Mouth opening and facial swelling—preoperatively

	Mouth opening	Tragus-commissure	Gonion-commissure	Gonion-external canthus
Masseteric injection (group I) mm	43.33	104.74	93.64	106.28
Gluteal injection (group II) mm	42.76	103.93	92.86	106.73
<i>p</i> value	0.235	0.353	0.494	0.235

Table 3 Mouth opening and facial swelling 2 days postoperatively

	Mouth opening	Tragus-commissure	Gonion-commissure	Gonion-external canthus
Masseteric injection (group I)	32.53	108.89	98.34	109.86
Gluteal injection (group II)	31.66	107.94	97.85	108.92
SD	1.131	1.706	1.186	2.02
<i>p</i> value	0.231	0.353	0.494	0.235

Table 4 Mouth opening and facial swelling 7 days postoperatively

	Mouth opening	Tragus-commissure	Gonion-commissure	Gonion-external canthus
Masseteric injection (group I)	38.62	105.16	94.14	108.36
Gluteal injection (group II)	39.46	104.54	93.52	106.62
SD	1.155	1.735	1.348	1.242
<i>p</i> value	0.264	0.524	0.402	0.087

impacted teeth. Methylprednisolone is commonly used as an anti inflammatory drug to reduce such post surgical morbidity. With a half life of 18–36 h, methylprednisolone is more potent than hydrocortisone and has no mineralocorticoid activity [4, 5, 7, 11, 12, 13]. Though literature states that the site of administration has no impact, studies have been conducted to assess the efficacy of the steroid injection in various sites of administration [6]. The more comfortable route for the patients has been reviewed as the oral route, but its efficacy compared with the parenteral route is not predictable [8]. Following the removal of impacted third molars, either 40 mg methylprednisolone injected into gluteal region or an intravenous dose of 125 mg is reported to reduce swelling, pain and trismus associated with the surgery [7, 14, 15]. The surgical reviews have proved that intramuscular route is a better route for administration when compared to the oral route on the basis of plasma drug concentration and anti inflammatory action [8]. However, in most of the practices, the steroid injections are administered in the gluteal region before or after the surgical removal of impacted teeth or any other surgery. But the experience of the dental surgeons has also suggested that patient's discomfort or inconvenience present as the limiting factors for gluteal administration [8]. Few studies have shown masseteric administration to be more favorable in decreasing pain,

swelling and trismus [7, 16]. This motivated us to evaluate the possibility of considering the masseter muscle at operative site for methyl prednisolone injection and its efficacy in reducing the postoperative morbidity in the present study.

In this study, methylprednisolone 40 mg (Melpred injection 40 mg vial, Cipla, Indian company) was injected into masseter through intrabuccal approach after anesthetizing inferior alveolar, lingual and buccal nerve and before placing the incision. The technique is relatively more convenient for the surgeon since the injection is carried out in proximity to the surgical area which is pre anesthetized by local infiltration of lidocaine solution into the masseter region, which anesthetize the terminal branches of masseteric nerve after the long buccal nerve block. Of the ten patients, first two patients showed painful spasm of masseter muscle during intra buccal masseteric injection lasting for few seconds, which could be attributed to superficial and higher level of injection (middle third of masseter), this complication was avoided in rest of patients by giving the injection at the anterior fibers of masseter muscle by palpating the masseter muscle extra orally and as close as possible to the region of the long buccal nerve block which was at the level of coronoid notch thus helping us also to understand the surgical anatomy better for skillful administration of the injection.

Conclusion

This study shows that there is no significant difference between the intrabuccal approach of masseteric injection and gluteal injection of methylprednisolone in terms of pain, swelling and trismus following the surgical removal of impacted lower third molars. However, the intrabuccal approach of masseteric injection is more convenient for the surgeon and painless for the patient than gluteal injection, since it is administered in close proximity to the surgical area which is already anesthetized. Also, the inconvenience and pain due to the gluteal injection can be avoided. Though the case selection was similar with difficulty index and bilateral impacted teeth in the same patient, the sample size was not sufficient. Hence the study needs to be undertaken with larger samples to substantiate our findings.

Conflict of interest None.

Ethical standard Institutional ethical committee approval obtained.

References

1. Strean LP, Horton CP (1953) Hydrocortisone in dental practice. *Dent Digest* 59:8
2. Spies TD, Dreizen S, Stone RE, Garcia-Lopez G, Lopez-Toca R, Reboredo A (1952) A clinical appraisal of ACTH and cortisone as therapeutic agents in dental medicine. *Oral Surg Oral Med Oral Pathol* 5(1):25
3. Gee J (1974) Therapeutic use of corticosteroids in dentistry. A review. *NY State Dental J* 40(2):89
4. Ganong WF (2010) Review of medical physiology, 23rd edn. Mc Graw Hill Medical publication, New York
5. Penarrocha D, Saez C, Sanchis B, Bagan S, Gay-Escoda C (2000) Estudio de las complicaciones postoperatorias tras la extracción quirúrgica de 190 terceros molares mandibulares incluidos. *Av Odontoestomatol* 16(7):435–441
6. Beirne OR, Hollander B (1986) The effect of methylprednisolone on pain, trismus, and swelling after removal of third molars. *Oral Surg Oral Med Oral Pathol* 61(2):134–138
7. Messer EJ, Keller JJ (1975) The use of intraoral dexamethasone after extraction of mandibular third molars. *Oral Surg Oral Med Oral Pathol* 40(5):594–598
8. Montgomery MT, Hogg JP, Roberts DL, Redding SW (1990) The use of glucocorticosteroids to lessen the inflammatory sequelae following third molar surgery. *J Oral Maxillofac Surg* 48(2):179–187
9. Schaberg SJ, Stuller CB, Edwards S (1984) Effect of methylprednisolone on swelling after orthognathic surgery. *J Oral Maxillofac Surg* 42(6):356–361
10. Ustun Y, Erdogan O, Esen E, Deniz E (2003) Comparison of the effects of 2 doses of methylprednisolone on pain, swelling, and trismus after third molar surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 96(5):535–539
11. Milles M, Desjardins PJ (1993) Reduction of postoperative facial swelling by low-dose methylprednisolone: an experimental study. *J Oral Maxillofac Surg* 51(9):987–991
12. Holland C (1987) The influence of methylprednisolone on postoperative swelling following oral surgery. *Br J Oral Maxillofac Surg* 25(4):293–299
13. Sisk AL, Bonnington GJ (1985) Evaluation of methylprednisolone and flurbiprofen for inhibition of the postoperative inflammatory response. *Oral Surg Oral Med Oral Pathol* 60(2):137–145
14. Mico-Llorens JM, Satorres-Nieto M, Gargallo-Albiol A, Arnabat-Domin-Guez J, Berini-Aytes L, Gay-Escoda C (2006) Efficacy of methylprednisolone in controlling complications after impacted lower third molar surgical extraction. *Eur J Clin Pharmacol* 62(9):693–698
15. Esen E, TaÅYar F, Akhan O (1999) Determination of the anti-inflammatory effects of methylprednisolone on the sequelae of third molar surgery. *J Oral Maxillofac Surg* 57(10):1201–1206
16. Vegas-Bustamante E, Mico-Llorens JM, Gargallo-Albiol A, Satorres-Nieto M, Berini-Aytes L, Gay-Escoda C (2008) Efficacy of methylprednisolone injected into the masseter muscle following the surgical extraction of impacted lower third molars. *Int J Oral Maxillofac Surg* 37(3):260–263