



IS C- REACTIVE PROTEIN A BETTER INDICATOR OF INFLAMMATION AFTER SURGICAL REMOVAL OF MANDIBULAR THIRD MOLAR? - A PROSPECTIVE STUDY

Dentistry

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ABSTRACT

Objectives: To evaluate whether haematological levels of C-reactive protein (CRP) rise with postoperative inflammatory events following third molar surgery, and to assess the correlation of CRP levels with clinical signs of inflammation pain and swelling. **Materials and Methods:** Fifty patients aged 18–30 years were included. Preoperatively, pain was assessed using a visual analogue scale, facial measurements were recorded for swelling, and maximum interincisal distance was measured with digital Vernier callipers. Baseline CRP levels were estimated by latex slide agglutination. Surgical extractions were performed under local anaesthesia. Patients were reassessed at 48 hours and 7 days for pain, swelling, trismus, and CRP levels. Data were tabulated and analysed using SPSS, with a chi-square test applied to correlate preoperative CRP with postoperative outcomes. **Results:** CRP levels showed a significant rise at 48 hours, returning near normal by day 7, confirming its role as a prognostic marker of inflammation. Pain scores and facial measurements also showed significant variations across time intervals. **Conclusion:** Postoperative pain, swelling, and trismus were greater in patients with higher preoperative CRP levels. Hence, CRP is a reliable predictor of postoperative discomfort symptoms such as pain, swelling, and trismus.

KEYWORDS

INTRODUCTION

The incomplete eruption of third molars is most common and has serious clinical consequences.^[1] The surgical extraction of impacted teeth is a challenging surgical procedure for the oral surgeon and a complicated intervention for the patient.^[2] The surgical procedure is associated with complications, among which pain, swelling and trismus are commonly reported. These complications are the manifestation of an inflammatory response, which is an immediate consequence of the surgical extraction.^[3] The knowledge of various methods to reduce postoperative complications of third molar surgery, along with reliable indicators of postoperative complications, will help surgeons and patients manage postoperative discomfort.^[4]

Acute inflammation is the local tissue response to injury or infection. Alteration of serum levels of acute-phase proteins is a nonspecific response that is observed when inflammation is present. C-reactive protein is one such acute-phase protein. Hepatocytes secrete it in response to interleukin-6 secreted from inflammatory sites. It acts synergistically with lipopolysaccharides to induce tissue factor production by monocytes. In healthy individuals, the C-reactive protein level is less than 10 mg/L. There is an increase in the level of this protein that occurs 6 hours after surgical trauma and reaches to its maximum level between 24 and 48 hours after tissue injury and returns to normal in 7 days.^[5,6] The present study aims to evaluate whether C-reactive protein is a better indicator for the prediction of post-operative pain, swelling and trismus after third molar extraction by evaluating the relation between pre- and post-operative levels of C-reactive protein and post-operative discomfort symptoms.

MATERIALS AND METHODS

This study was conducted in the Department of Oral and Maxillofacial Surgery, Panineeya Mahavidyalaya Institute of Dental Sciences and Research Centre, Hyderabad, from January 2015 to September 2016. Institutional Ethical Committee clearance was obtained before starting the study. Young adults in the age group of 18-25 years with

mesioangularly impacted mandibular third molar teeth were included in the study. Patients on antibiotics or analgesics preoperatively with previous or existing cardiovascular diseases, diabetes mellitus, pericoronitis or local inflammation and periodontitis were excluded. Patients with impacted mandibular third molars, which require surgical extraction, were selected.

Detailed case histories and clinical examination findings of the included patients were recorded. A minor surgical profile was done before the surgery. Well-informed written consents were taken from the patients. Fifty cases were performed under local anaesthesia. Preoperatively, the facial measurement was recorded by measuring the distance from the corner of the mouth to the ear lobe and from the lateral canthus of the eye to the inferior border of the mandible on the side indicated for surgical extraction of the third molar.

Under strict aseptic conditions, procedures were performed under local anaesthesia of 2% lignocaine with 1:80,000 adrenaline given in the form of Inferior alveolar, Lingual and Long buccal nerve blocks. The standard surgical technique was followed.

The ward's incision was given and a mucoperiosteal flap was raised in all the patients to access the third molar. Buccal and distal bone guttering and odontectomy of the tooth were done if required.

All patients were prescribed the same postoperative medication. Postoperative instructions were given to the patient. The patients were assessed at the intervals of 48 hours and 7th day after surgery for pain, swelling, trismus and C-reactive protein levels in blood.

The collected data is tabulated and analysed using SPSS (Statistical Package for the Social Sciences) statistical analysis. Chi-square test was used to measure the correlation between the preoperative blood level of CRP with pain and swelling measured postoperatively at regular intervals of 48 hours and 7 days. C-reactive protein levels are estimated by latex-enhanced nephelometry.

RESULTS

In this study, the sample size includes 50 patients (21 females and 29 males) with ages ranging from 17 years to 35 years. The data was analysed using SPSS version 22 software. Descriptives, Paired t test, chi-square test (Friedman test) were performed for pre- and post-operative comparisons.

The mean age of the males was 24.66 and the females was 23.33, which was not statistically significant ($p=0.24$). (Table 1) There is a statistically significant difference present in the mean levels of CRP preoperative and 48 hours postoperatively ($P=0.025$). There is a significant increase in the CRP levels at the 48h postoperative period. There is no statistically significant difference present in the mean levels of CRP preoperative and 7 days postoperatively ($P=0.668$). (Table 2)

This indicates that the CRP levels have reached near normal. This indicates CRP is a prognostic marker for inflammation identification, as it returns to normal after a specified time. There are statistically significant differences present in mean pain scores at various time periods. The lowest is preoperatively (mean = 0.22), and the maximum is 48 hours postoperatively. After 1 1-week postoperative period, there is a significant difference from the preoperative period. (Table 3)

There are statistically significant differences present in mean facial measurements at various time periods. The lowest is preoperatively, and the maximum is 48 hours postoperatively. After 1 1-week postoperative period, there is a significant difference from the preoperative period. (Table 4)

There are statistically significant differences present in the mean mouth opening at various time periods. The mouth opening is maximum preoperatively and minimum at 48 hours postoperatively. Even after 1 1-week postoperative period, there is a significant difference from the preoperative period. (Table 5)

DISCUSSION

Inflammation is the local response of living tissues to injury due to any agent. It is a body defence reaction to eliminate or limit the spread of an injurious agent and to remove the consequent necrosed cells and tissues. Transalveolar surgical extraction of impacted mandibular third molar is one of the most common minor surgical procedures for an oral surgeon. This procedure requires raising the mucoperiosteal flap and bone guttering using burs or a chisel and mallet. Postoperative pain and swelling are common complications reported after the procedure, which may be aggravated by pre-existing inflammation and infection.^[5]

Pain, swelling, trismus, haemorrhage and dry socket are the most common symptoms following removal of impacted teeth. There is increased morbidity with the age of the patient, position and location of the tooth and duration of the surgical procedure. The postoperative sequelae of the surgical procedure directly affect the quality of the patient's life.^[6] Few complications may be associated with infection and include exposed necrotic bone, ulceration, soft tissue swelling and erythema, intraoral/extraoral sinus, localised or generalised lymphadenopathy.^[7] Chander et al in their study, evaluated the relation between pre-operative pain and pre-operative levels of C-reactive and post-operative pain and swelling in impacted third molar surgery.

They observed that preoperative pain, swelling, and mouth opening were seen to be variable in all the cases having high C-reactive protein levels. They found C-reactive protein to be a better indicator of inflammation than preoperative pain, swelling and mouth opening for post-operative discomfort.^[5] C-reactive protein is an acute reactant of an inflammation. It is a good indicator of the general immune status of the body.^[8]

It was discovered by Tillet and Francis in 1930 in the serum of patients with pneumonia. The name is derived from its ability to react with C polysaccharide isolated from pneumococcal cell walls. It is a member of the pentraxin family of proteins. They are ligands for leukocyte Fcγ receptors. The CRP gene is located on the first chromosome.^[9]

The amount of CRP produced by the body varies from person to person, and this depends on an individual's genetic makeup and lifestyle. The circulating value of CRP reflects ongoing inflammation and/or tissue damage much more accurately than other laboratory parameters of the acute-phase response. Early laboratory methods were only qualitative in nature until the late 1970s, when significant advances in isolating CRP and measuring to the picogram range were

made. Most clinical laboratories now use laser nephelometric assay because of its ease of use, speed, and reproducibility. Analytical methods for CRP determination include Enzyme-linked immunosorbent assay (ELISA), Immunoturbidometry, rapid immunodiffusion, and visual agglutination.^[10]

CONCLUSION

Post-operative complications like pain, swelling and trismus were reported more in those patients who were seen to have high levels of serum C-reactive protein preoperatively and less in those who had lower preoperative CRP levels. C-reactive protein levels rose to peak levels in the post-operative period till 48 hours, and were comparatively less on the 7th day post-operatively. Thus, pre-operative levels of C-reactive protein were seen to be a reliable indicator for the prediction of post-operative discomfort symptoms like post-operative pain, swelling and trismus. Thus, estimation of C-reactive protein levels pre-operatively helps in making clinical decisions such as taking preoperative medications to minimise post-operative discomfort to a minimum.

Gender	N	Mean Age	SD	Significance
Male	29	24.66	4.36	0.249 NS
Female	21	23.33	3.73	
Overall	50	24.1	4.12	

TABLE 1: Mean Age and SD of the study population according to gender

Parameter	N	Mean	Std. Deviation	Std. Error Mean	Mean Difference	Sig
CRP Pre Operative	50	10.91	12.2100	1.7268		
CRP After 48 hrs	50	14.98	7.6351	1.0790	4.0700	0.025*
CRP Pre Operative	50	10.91	12.2100	1.7268		
CRP after 7 Days	50	10.19	7.0645	1.0033	0.7340	0.668 NS

TABLE 2: Comparison of mean C reactive protein levels at various time periods

	N	Minimum	Maximum	Mean	Std. Deviation	Mean Rank	Chi square Sig
Pain Pre Operative	50	0	2	0.22	0.405	1.17	
Pain After 48 hrs	50	1	5	3.88	0.957	3.00	<0.001**
Pain After 7 Days	50	0	2	1.12	0.715	1.83	

TABLE 3: Comparison of mean pain levels at various time periods

Parameter	N	Mean	Std. Deviation	Std. Error Mean	Mean Difference	Significance
Preoperative Facial measurements	50	11.095	0.49779	0.07040		
Facial measurements for Swelling After 48 hrs	50	11.578	0.51301	0.07255	0.48300	<0.001**
Preoperative Facial measurements	50	11.095	0.49779	0.07040		
Facial measurements for Swelling After 7 days	50	11.220	0.49713	0.07031	0.12500	<0.001**

TABLE 4: Comparison of mean facial measurements at various time period

Parameter	N	Mean	Std. Deviation	Std. Error Mean	Mean Difference	Sig
Pre Operative	50	52.48	6.475	0.919		
After 48 hrs	50	25.32	7.023	0.993	-27.160	<0.001**
Pre Operative	50	52.48	6.475	0.919		
After 7 Days	50	42.06	6.604	0.900	-9.920	<0.001**

TABLE 5: Comparison of mean mouth opening levels at various time periods

REFERENCES

- Jonas Capelli: Mandibular growth and third molar impaction in extraction cases. The Angle. Orthodontist. 1991, 61:223-229.
- Pitekova L, Satko I, Novotnakova D: Complications after third molar surgery. Bratislav Lek Listy. 2010, 5:296-298.
- Osunde OD, Adebola RA, Omeje UK: Management of inflammatory complications in third molar surgery: A review of the literature. African Health Sciences. 2011, 11:530-537.
- Cetin Kasoglu, Amila Brkic, Banu Gurkan: Complications Following Surgery of Impacted Teeth and Their Management. A Textbook of Advanced Oral and Maxillofacial Surgery.
- PM Chander, FM Ali: V Aher C-reactive protein a better indicator of inflammation after third molar extraction. Nigerian Journal of Clinical Practice 2013;16. 3:297-301.
- Barbara Noack, Robert J. Genco, Maurizio Trevisan, Sara Grossi. C-Reactive Protein - A Predictor of Heart Disease - Is Elevated in Patients with Periodontal Disease. Journal of Periodontology. 2001, 72:1221-1227.
- Andre Carlos de Freitas, Antonio Luiz Barbosa Pinheiro: Assessment of anti-inflammatory effect of 830 nm Laser light using C - C-reactive protein levels. Brazilian Dental Journal. 2001, 3:187 - 190.
- Lucia Lago Mendez, Marcio Diniz Freitas, Carmen Senra Rivera: Relationships Between Surgical Difficulty and Postoperative Pain in Lower Third Molar Extractions. Journal of Oral and maxillofacial surgery 2007;65(5. 979-983.
- Yan-Fang Ren, Hans S. Malmstrom Rochester NY: Rapid quantitative determination of C-reactive protein at chair side in dental emergency patients. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2007, 104:49-55.
- Garish Nagarale, S. Ravindra, Srinath Thakur, Swati Setty: Efficacy of a chairside diagnostic test kit for estimation of C-reactive protein levels in periodontal disease. Journal of Indian Society of Periodontology. 2010, 14:216