

Study: “Can C Reactive Protein be used as Prognostic Tool in Treatment of Mandibular Fracture”

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Abstract: Aim of the present study is to evaluate, can C reactive protein be used as prognostic tool in treatment of mandibular fracture by comparing its preoperative and postoperative level during open reduction and internal fixation and correlate it with convalescent period. **Method:** blood sample were collected and CRP level were compared preoperatively, postoperatively, after 24 hr, and on seventh postoperative day. **Result:** preoperative level of CRP was high, postoperatively there was noticeable increase in its level, after 24 hr its level was increased markedly but on the seventh day its level was significantly decreased to attain the normal level, which show there is normal healing at the surgical site. **Conclusion:** the above study gives the idea that, C reactive protein can be used as prognostic tool in the treatment of mandibular fracture and it is helpful to avoid prolonged antibiotic therapy usage.

Keywords: C reactive protein, fracture, trauma, infection, tumour necrosis factor

1. Introduction

Now a days road traffic accidents becomes very common due to increased use of vehicles. Head injury is the most common in RTA patient along with maxillofacial trauma in which mandibular fractures alone accounts to 61% of all the fractures. The sequel of a mandibular fracture will invariably leads to swelling which may be just an inflammatory response or as a result of infection prior to treatment due to which it is difficult to differentiate between two. There are so many laboratory aids to investigate or to evaluate the prognosis of healing. Interleukin (IL-6), Tumour necrosis factor (TNF), C reactive protein (CRP), and soluble receptors (IL-2 SR, IL-6SR, TNF SR1 and TNF SR-2). Besides other bacterial markers such as WBC, absolute neutrophil count (ANC) etc. C reactive protein is gaining importance as we know C-reactive protein is an acute phase protein, it is duly synthesised by liver in response to tissue injury. There may be trace amount of CRP found in healing patient blood serum^{1,4}. After damage to tissue macrophages are released which are important for secretion of CRP^{2,3,5}. Interleukin 6 (IL-6) is the most important factor that stimulates macrophages, interleukin 1 (IL 1) and tumour necrosis factor (TNF- α) stimulates macrophages, monocytes, fibroblasts, endothelium cells and others to produce IL-6^{6,7,8}. The defensive and reparative role in the organism is performed by CRP^{3,4,9,10}. There is marked increased in the serum CRP level after bacterial infections which in few hours' infection elicit a powerful inflammatory response both systemically and locally with chemotactic cytokine release in to the circulation. C reactive protein appears in plasma as early as 2 hr after the trauma and it reaches its peak 48-72 hr after the injury. In non complicated cases it returns to normal after 6, 7 days^{7,9}. however its value fall down gradually, it increases when healing is interrupted by a bacterial infection, oral cavity is full of bacterial flora which makes facial fracture in danger of infection, when CRP level normalised the routine antibacterial therapy may be stop to avoid prolonged antibiotic therapy side effects¹¹.

The aim of the present study is to evaluate the CRP levels pre-operatively and postoperatively following the surgical intervention of mandibular fracture with open reduction and internal fixation and it correlates the outcome of surgery with in convalescent period.

2. Material

- C reactive protein standard serum (Human containing sodium azides 0.1%)
- C reactive protein buffer (solution containing phosphate buffer 120mmol/L) & sodium azides 0.09%
- C reactive protein antibody (solution containing goat anti human CRP 0.9MG/ML) & sodium azides 0.09%
- Reagent
- Auto analyzer equipments

After preparation of cubital fossa with antiseptic solution 3cc of blood has been withdrawn in 23 gauge 5cc needle without tourniquet and sample transferred into the glass tube for centrifugation at 4000rpm for 20min. The serum part was taken into the clean test tube, analysis was done by autoanalyzer method. the collected serum sample was mixed with buffer and antibody. After combination of antihuman CRP in the reagent with CRP in sample yields an insoluble aggregates which causes increased turbidity in the solution. The degree of turbidity of solution was measured optically which is proportional to the amount of CRP in the patient's sample.

3. Method

Twenty five patients with mandibular fracture due to trauma were operated by ORIF method under general anaesthesia with the clearance from ethical committee. Blood sample was collected pre-operatively, immediate postoperative, after 24hr and on the 7th postoperative day to determine the concentration of CRP at various intervals. Patients age

groups were selected between range 18- 50 yrs. the prophylactic antibiotics were started to all the admitted patients, medically compromised patients were evaluated from the study. The time interval between occurrence of trauma and surgery ranged from a period of 7 to 30 days. in all the cases extra-oral approach has been used.

4. Results

The age of patient was 18 to 50 yr in our study with a mean age of 30.5 ± 9.5 yrs. The time interval between the occurrence of trauma and the surgery range from period of 7 to 30 days with a mean of 9±8 days.the time period for the surgery ranged from 30 to 150 min with a mean range 40± 32 min.

The CRP level was significantly high at the time of admission of patient after trauma due to immediate response of body to the injury.

There was also rise of CRP level seen immediately after the surgery that is 1.96 ± 0.56 mg/dl. After 24 hr postoperatively there is marked increased in the level of CRP upto mean value 2.3 ± 0.58 mg/dl, the level of CRP gradually come down as the intensity of inflammation decreases on 7th post operative day and achieves normal value up to 1.58 ± 0.52 mg/dl which indicates uncomplicated healing at the surgical site.

5. Discussion and Conclusion

the discovery of C reactive protein was done by Illett and Francis in 1930¹⁵ while investigating the serological reactions in Pneumonia with various extracts of Pneumococci and during experiment they found a nonspecific and somatic polysaccharide fractions to which they name as Fraction C.

Study on 80 patient of mandibular fracture alone by Izuka⁹, in which open reduction and internal fixation was used by following AO/ASIF principles, in this they found that the value of CRP before ORIF i.e preoperatively is 28.5mg/l and it reaches maximum of 73.2mg/l on the second day of the surgery.

As we know CRP has an important role in our defence mechanism by participating in nonspecific immunity system so in initial period of trauma the levels of CRP markedly raised and which gradually comes down as a result of treatment with antibiotics and analgesics.

Another example of this kind of description is the study done by Wermen¹⁹ who has shown that there is increased level of β globulin and CRP after trauma and surgery so our study coincides with Werner’s conclusion.

According to our study initially the levels of CRP were increased (mean value 1.57mg/dl). It may be due to normal response of body to the tissue injury which leads to the inflammation or it may be due to presence of infection at the site of trauma or may be because of both inflammation

and infection before the operation. In between the period before the surgery CRP level was decreased due to administration of antibiotics therapy. But after 24 hr of surgery its value increases (mean value 2.30 ± 0.58mg/dl) even though the maintenance of analgesics and antibiotics was done which indicates that CRP is an acute phase protein. The level of CRP decreases gradually and on 7th postoperative day it comes down to normal level which confines that uncomplicated healing and absence of infection at the site of surgery.

Although it may be un-conclusive that makes differentiation about the raised CRP value due to post surgical inflammation or the infection condition because the clinical signs of inflammation and infection are same. So CRP can be used as a prognostic tool as its level decreases after administration of antibiotics and its value were increases when there is interrupted complicated healing which may be due to bacterial infection as the oral cavity is full of bacterial flora.

The preoperative antibiotic and anti-inflammatory therapy may be stopped. When the plasma CRP level normalised hence prevent the prolonged antibiotic therapy with its side effects and also helps to reduce the hospital stay of patient.

Thus the above study gives the idea that, C reactive protein can be used as prognostic tool in the treatment of mandibular fracture and it is helpful to avoid prolonged antibiotic therapy usage.

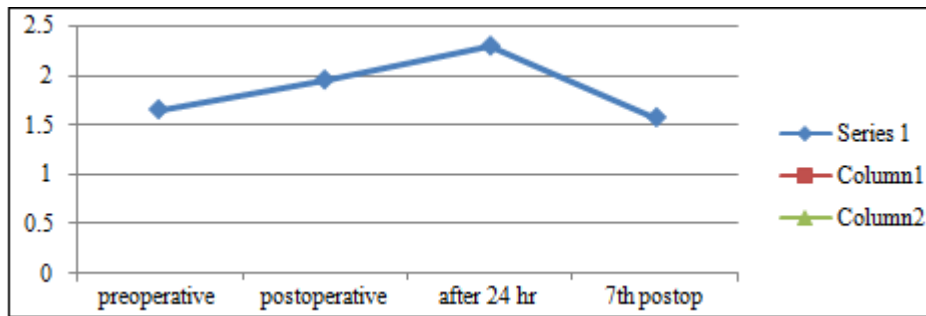
Table 1: Frequency distribution with C – reactive protein level at different time

	CRP (mg/dl)	preoperative	postoperative	After 24 hr	7 th postoperative day
1	0.1 – 0.5	1	-	1	1
2	0.5 – 1	2	3	-	3
3	1- 1.5	3	4	2	6
4	1.5- 2	10	4	3	12
5	2 – 2.5	8	12	8	2
6	2.5 – 3	2	2	10	1
7	3- 3.5	-	-	1	-
	Total	25	25	25	25
	Mean CRP± SP	1.66 ± 53	1.96 ± 0.56	2.30± 0.58	1.58 ± 0.52

Table 2: Post operative changes in C reactive protein levels

Time interval	CRP levels (mg/dl)				Difference from preoperative	Significance of difference	
	min	max	Mean	SD		t value	P value
	0.3	2.2	1.66	0.53	-		
	0.6	2.6	1.96	0.56	0.30 ± 0.13	11.33	0.001Hs
	0.8	3.2	2.30	0.58	0.64 ± 0.26	12.34	0.001Hs
	0.4	2.6	1.58	0.52	0.08 ± 0.29	1.51	0.14 Hs

Graph



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