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Research Paper

An Assessment of C-Reactive Protein for Early Detection of Post-Operative Infection After Surgical Management of Mandibular Fractures

Medical Science

KEYWORDS : C - reactive protein, Infection, Mandibular fractures, CRP, Trauma.

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ABSTRACT

Background: The aim of the present study is to evaluate the C-reactive protein (CRP) levels pre-operatively and post-operatively in patients with mandibular fracture treated by Open reduction and internal fixation with an objective to evaluate the uneventful healing of the surgical wound and mandibular fracture.

Methods: We have evaluated CRP levels in 50 patients with mandibular fractures treated with open reduction and internal fixation. The blood samples were collected pre-operatively during hospitalisation and immediately before surgery, immediate post-operative, delayed post-operative (after 24 hrs), and on seventh post-operative day.

Results: CRP levels were high preoperatively immediately after trauma because of body's initial inflammatory response. An elevated response was noticed immediate post-operatively (mean value of 1.96 +_ 0.56 mg/dl). Delayed post-operative samples also showed a marked rise in CRP levels (mean value of 2.3 +_ 0.60 mg/dl). Later, there was a significant decrease in CRP levels (on seventh day mean value of 1.53 +_ 0.64 mg/dl), indicating an uneventful healing at the surgical and fracture site.

Conclusion: Monitoring of CRP levels was found to be a better procedure for ensuring non-complicated uneventful healing of mandibular fractures post-operatively.

INTRODUCTION:

"Face is the index of mind" – Man's face is his single most distinguishing physical characteristic. The aesthetic importance of human face stems from its conspicuous location in the exposed anatomy. In addition, the face is the carrier of the senses and is the center for vital functions of speech and mastication.

Maxillofacial trauma is no exception and in fact is the most frequently seen injury in the emergency room.

From the time of Hippocrates, physicians have described many different techniques for treating mandibular fractures, the principle of which has always been repositioning and immobilization of the bony fragments 5.

C-reactive protein is an acute phase reactant of inflammation seen post-operatively or after any trauma. In a healthy individual C-reactive protein level is less than 10 mg/L which increases by two folds every 8 hours post-operatively and returns to normal in 7 days[6].

Bacterial infection is a particularly potent stimulus with marked elevation in serum CRP levels occurring within a few hours. Infection elicits a powerful inflammatory response, both locally and systemically, with chemotactic cytokine response into the circulation[1].

The aim of the present study is to evaluate monitoring of CRP levels as a better indicator of non-complicated and uneventful healing following surgical management of mandibular fracture with Open reduction and Internal fixation.

MATERIALS & METHODS:

This study was conducted in Department of Dentistry, Rajiv Gandhi Institute of Medical Sciences, Adilabad during the period from January 1 2011 to January 1 2014.

The CRP concentration was evaluated in about 50 patients with mandibular fractures treated by open reduction and internal fixation pre-operatively during hospitalisation, before surgery, immediate post-operative, delayed post-operative and on the seventh post-operative day.

The patients belonging to age groups 16 – 45 were included in this study. Patients with malnutrition, endocrine, immunological, hepatocellular and cardiovascular diseases were excluded from the study.

The time interval between occurrence of trauma and the surgery ranged from 2 to 18 days.

Out of 50, 36 patients were treated Intraorally and 14 patients were treated extraorally. About 23 patients were treated under General Anaesthesia and 37 were treated under Local Anaesthesia. The duration of surgery ranged from 35 to 150 min.

The criteria for diagnosis of post-operative infection was the presence of pus, swelling and pain.

To check the C-reactive protein levels pre- and post-operatively, 5ml of patient's blood was drawn each time and was centrifuged at 3000 rpm for 10 min to obtain serum separately which was gently pipetted off into a clean tube using a glass pipette. Samples were analysed by auto analyser method. The degree of turbidity of the solution was measured optically which is proportional to the amount of CRP in the patient's sample.

RESULTS:

In the present study, out of 50 patients, 39 were males and 11 were females, with age ranging from 16 – 45 years with mean age of 38.5 years.

The time interval between trauma and surgical management ranged from 2 – 18 days, with a mean of 10 days.

The duration of surgery ranged from 35 – 150 min, with a mean of 40+_ 32 min.

The CRP levels were slightly elevated pre-operatively when the patients were hospitalised because of the initial response of the body to the trauma.

The CRP levels slightly decreased reaching near normalcy immediately before surgery with a mean value of 1.66+_ 0.53 mg/dl (TABLE 1).

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During the immediate post-operative period, there was an increase in CRP level to 1.96+_ 0.56 mg/dl.

During the delayed post-operative period (24 hrs), there was a considerable increase in CRP levels with mean value of 2.3 +_ 0.60 mg/dl indicating enhanced inflammatory process happening in the body (TABLE 2).

On the seventh post-operative day, CRP levels significantly reduced and reached near normal levels (1.53 +_ 0.64 mg/dl) except in 8 patients where the CRP levels were still high (2.1+_0.57 mg/dl) associated with swelling and pus discharge from the surgical site. These patients were treated with antibiotics.

The CRP levels were found to be considerably elevated postoperatively in patients treated with extraoral approach with a mean of 2.54 in the sample taken after 24 hours post-operatively. This indicates the amount of surgical trauma involved in extraoral approach than intraoral approach (TABLE 3).

DISCUSSION:

C-reactive protein (CRP), an acute-phase reactant, was discovered in the serum of patients with pneumonia by Tillett and Francis in 1930, as they were investigating their sera with various extracts of pneumococci.

Avery et. Al., characterized the C-reactive material as a protein which required calcium ions for its reaction with CPS and introduced the term 'acute phase protein' to refer to sera which contains CRP[1].

In the present study, CRP levels were elevated at the time of hospitalisation with a mean value of 1.56 mg/dl which is due to body's initial response to trauma. But these CRP levels reached normalcy immediately before surgery, because of pre-operative administration of antibiotics.

Post-operatively, there was a slight increase in CRP levels during the immediate post-operative period with mean value of 1.96 mg/dl. But in the delayed post-operative period of 24 hours after surgery, the CRP levels were considerably elevated inspite of antibiotic administration, which indicates the body's defense inflammatory response to surgical trauma.

On the seventh post-operative day, almost all cases demonstrated decrease in CRP levels except in 08 cases. These 08 cases were diagnosed as post-operative wound infection as they also demonstrated clinical signs and symptoms like pain in the site, swelling, pus discharge from the surgical site. These patients were further administered antibiotics.

CRP has previously shown to be of value for detection of post-operative complications, especially deep wound infections[3].

Markus Neumaier et al. indicated that a persistent rise in CRP level is indicative of complications. A patient with CRP level above 96 mg/L after fourth day of surgery is very likely to have a wound infection if no other reason (e.g., pneumonia) can be found. CRP concentrations of above 90% percentile in the time-dependent reference limit diagram after operative fracture treatment of the extremities are suspicious and warrant further diagnostic measures[3].

The estimation of CRP level certainly gives an indication of non-complicated wound healing, although CRP level cannot be said as the only parameter.

TABLE 1: PRE-OPERATIVE LEVELS OF C-REACTIVE PROTEIN

TIME INTERVAL	MINIMUM	MAXIMUM	MEAN	SD
During Hospitalisation	0.5	2.5	1.83	0.54
Immediately before Surgery	0.3	2.2	1.66	0.53

TABLE 2: POST-OPERATIVE LEVELS OF C-REACTIVE PROTEIN

TIME INTERVAL	MINIMUM	MAXIMUM	MEAN	SD
Immediate Post-operative	0.6	2.6	1.96	0.56
Delayed Post-operative (24 hrs after surgery)	0.8	3.2	2.30	0.60
7th Post-operative day	0.4	2.6	1.53	0.64

TABLE 3: COMPARISON OF C-REACTIVE PROTEIN LEVELS IN PATIENTS TREATED BY INTRAORAL AND EXTRAORAL APPROACHES

TIME INTERVAL	INTRAORAL APPROACH	MEAN	
		EXTRAORAL APPROACH	
Pre-Operative	During Hospitalisation	1.83	2.12
	Immediately before Surgery	1.60	1.87
Post-operative	Immediate Post-operative	1.88	2.20
	Delayed Post-operative (24 hrs after surgery)	2.12	2.54
	7th Post-operative day	1.53	1.63

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