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Role of C - reactive protein (CRP) In Diagnosing Peritonitis: An Observational Study

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Abstract

Aim: C-reactive protein (CRP), is an acute phase reactant, used by many to evaluate the risk of ischemic heart disease, peritonitis in patients on peritoneal dialysis as well as in predicting the outcomes following peritonitis. We here assessed baseline CRP levels in diagnosed cases of peritonitis of variable etiology, found on exploration and strived to establish this as a useful adjunct laboratory test in the diagnosis of peritonitis.

Materials and Methods: This observational study was conducted from April 2015 to June 2015 on 200 patients (100 patients with confirmed peritonitis found on exploration and 100 patients admitted for elective surgery without any obvious source or cause of inflammation), by measuring the baseline pre-operative CRP levels using turbidimetric assay.

Results: Of 200 patients, 146 were male and 54 were female with the mean age being 28.4 years. In patients with peritonitis, 95 % had CRP levels ≥ 10 mg/L while in patients without any evidence of inflammation only 8 % had CRP levels ≥ 10 mg/L. The sensitivity and specificity of CRP ≥ 10mg/L in diagnosing peritonitis was found to be 95 % and 92% respectively, while it was 96 % and 72% respectively for CRP ≥ 6mg/L.

Conclusion: CRP level measurement is a useful adjunct in the diagnosis of peritonitis and it can be very helpful in places where the physician has poor access to radiological studies.

Keywords: C- Reactive Protein, Turbidimetric Assay, Peritonitis

Introduction

Peritonitis is inflammation of the serous membrane lining the abdominal cavity and the visceral organs within. Peritonitis may be localized or generalized and is classified into primary, secondary and tertiary. A few markers of inflammation have been utilized in clinical work, including C-reactive protein (CRP), interleukin-6 (IL-6), and tumor necrosis factor – alpha (TNF-α). The CRP level is the most well-known and studied among these. A solitary raised CRP level joined with changes in other acute phase reactants is probably going to be an epiphenomenon. It is obscure whether this epiphenomenon speaks to an interminable condition or whether it is a pointer of a progressing intense procedure [1]. Most studies on the estimation of CRP in patients with acute abdomen have concentrated distinctly in acute appendicitis [2, 3]. Few studies have surveyed the diagnostic role of CRP in patients with suspected

peritonitis. The aim of this study was to assess the diagnostic role of C-reactive protein in suspected cases of peritonitis as an adjunct to clinical examination and other routine laboratory studies.

Materials and Methods

This observational study was conducted from April 2015 to June 2015 on 200 patients (100 with confirmed peritonitis found on exploration, Group A and 100 admitted for elective surgery without any obvious source or cause of inflammation, Group B) by measuring the baseline pre-operative CRP levels using turbidimetric assay.

Inclusion criteria

- All cases of either sexes with established peritonitis found on exploration and cases admitted for elective surgery.

Exclusion criteria

- Patients with chronic liver disease
- Patients with chronic kidney disease
- Immunosuppression (either due to disease, transplant or medication)
- Patients with previously treated peritonitis.
- Patients with autoimmune disease or inflammatory bowel disease.
- Recent surgery (within one month)

Patients satisfying the inclusion and exclusion criteria were after a thorough history, clinical examination and routine blood and radiological investigations (Fig. 1), subjected to assay of serum CRP based on turbidimetric measurement. Turbidity is caused by the formation of antigen-antibody insoluble immune complexes. The formation of these complexes is accelerated and enhanced by PEG which is one of the component of the reagent used.

Data with normally distributed continuous variables were presented as mean and analysed with student's t test. Non-normally distributed data were presented as median (range) and compared using the Mann Whitney test. Categorical variables were presented as number of patients and proportions (%), and were analysed using Fischer exact test. P-value < 0.05 was considered significant which was analysed using SPSS software.

Results

Of 200 patients, 146 were male and 54 were female (66 male and 34 female in Group A and 69 male and 31 female in Group B) with the mean age being 28.4 years. In Group A, the etiology behind peritonitis (Fig. 2 & 3) in decreasing order were Peptic perforation (35%), Appendicitis and appendicular perforation (32%), Enteric/ tubercular perforation (17%), Gangrenous sigmoid volvulus (12%), and Traumatic bowel perforation and Strangulated inguinal hernia (2% each). (Chart 1). While in Group B, the most common indications for elective surgery in decreasing order were Inguinal hernia (42%), Fibroadenoma (25%), Hydrocele (19%), Incisional hernia (11%) and Phimosis (3%). (Chart 2)

Of 100 patients in Group A, pain abdomen (100%) was the most common presenting symptom followed by vomiting (61%), **c**onstipation (57%), distension (52%), and fever (48%). (Table 1)

Table 1: Chief Complaints

Symptoms	Percentage
Pain abdomen	100%
Vomiting	61%
Constipation	57%
Distension	52%
Fever	48%

Patients in Group A, presented as early as on the day of onset of symptoms to as late as 9 days. (Table 2)

Table 2: Duration of presenting symptoms

Duration of symptoms in days	No. of patients
0 -1	33
1-2	18
2-3	20
3-4	15
More than 4	14

Chart 1: Group A

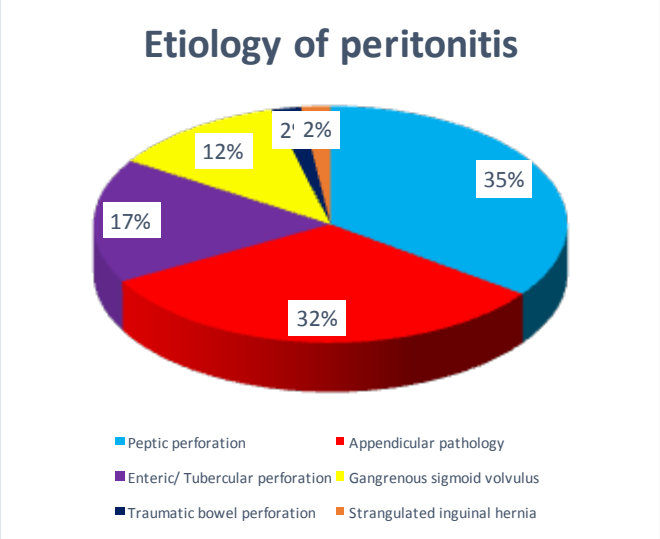
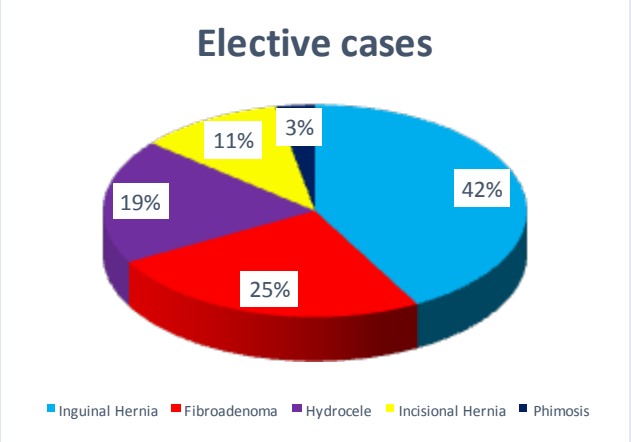


Chart 2: Group B



95% patients in Group A and 8 % patients in Group B had CRP ≥ 10 mg/L, while 96% patients in Group A and 26% patients in Group B had CRP ≥6 mg/L. Thereby, the sensitivity and specificity of CRP ≥ 10mg/L in diagnosing peritonitis was found to be 95% and 92% respectively, while it was 96% and 72% respectively for CRP ≥ 6mg/L in diagnosing peritonitis. The specificity was greater with a higher cut off value i.e. CRP ≥ 10 mg/L.

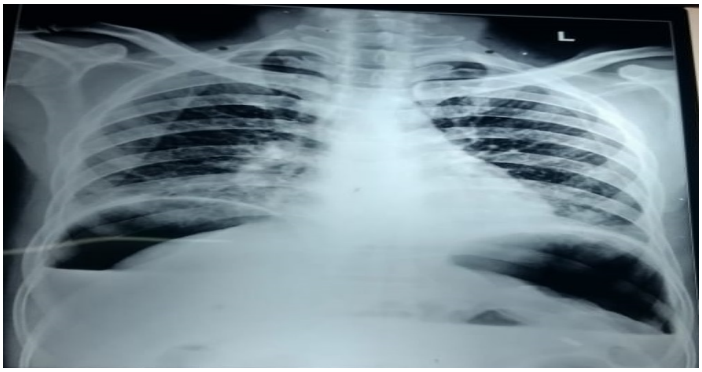


Fig. 1: Xray Chest and upper abdomen showing free gas under both domes of diaphragm in a case of peptic perforation.

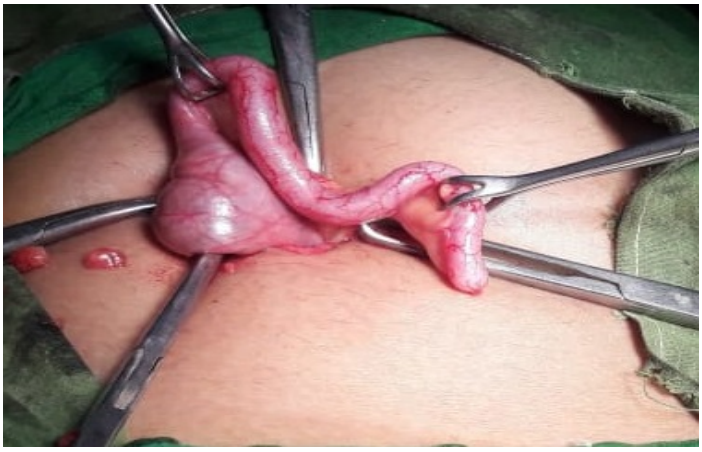


Fig. 2: Intraoperative photograph showing inflamed appendix.

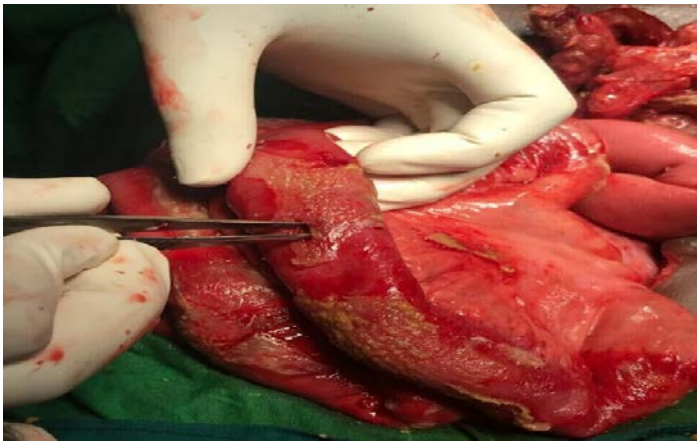


Fig. 3: Intraoperative photograph showing traumatic ileal perforation.

Discussion

Bacterial peritonitis can be classified into primary, secondary and tertiary peritonitis. Primary peritonitis is usually defined as diffuse bacterial infection of the peritoneal cavity occurring without loss of integrity of the digestive tract and usually involves one single pathogen. Secondary peritonitis is most commonly caused by perforation or anastomotic distruption of the digestive tract, and in about 80% of the cases it responds to timely surgical intervention combined with appropriate antimicrobial therapy. Tertiary peritonitis is characterized by poor recovery from secondary peritonitis despite appropriate surgical and antimicrobial treatment, occult infection with positive culture for fungi and gram negative bacteria with low pathogenicity, and impaired host defense[4-7].

Inspite of the advances in intensive care and antibiotic treatment, the hospital mortality rate of abdominal sepsis remains high. In a study of 125 patients with abdominal sepsis admitted to an intensive care unit, the hospital mortality rate was 63%[8]. Early diagnosis and aggressive therapeutic procedures is desirable and forms the corner stone for reducing the mortality[9]. To that end, biomarkers have been investigated as the means to diagnose peritonitis, although most have fallen short due to their poor specificity for infection. CRP is one of the acute phase reactants normally present in low levels. It is synthesized in the liver in response to inflammation. The synthesis and excretion of CRP increases dramatically within a few hours following acute trauma, infection etc. However, due to its poor specificity it is seldom used in the diagnosis.

In healthy adults, the normal concentrations of CRP varies between 0.8 mg/L to 3.0 mg/L. However, some healthy adults show elevated CRP at 10 mg/L. CRP concentrations also increase with age, possibly due to subclinical conditions[10]. In acute inflammation, CRP can increase as much as 50 to 100 mg/L within 4 to 6 hours in mild to moderate inflammation or an insult such as skin infection, cystitis, or bronchitis. It can double every 8 hours and reaches its peak at 36 to 50 hours following injury or inflammation. CRP between 100 and 500 mg/L is considered highly predictive of inflammation due to bacterial infection. Once inflammation subsides, CRP level falls quickly because of its relatively short half-life[11]. Elevations of CRP in the absence of clinically significant inflammation can occur in renal failure. CRP level is an independent risk factor for atherosclerotic disease. Patients with high CRP concentrations are more likely to develop stroke, myocardial infarction, and severe peripheral vascular disease[12]. Elevated level of CRP can also be observed in inflammatory bowel disease (IBD), including Crohn's disease and ulcerative colitis[13]. Thus CRP is a very sensitive marker of inflammation but lacks specificity. This statement has already been proved by many researchers in peritonitis of various etiologies. Taking its high sensitivity in identifying inflammation it can prove to be a useful adjunct in the diagnosis in places where radiological studies are not available.

Conclusion

CRP can be a useful adjunct in addition to routine blood investigations in diagnosing peritonitis. It can be used as an important tool in places where the physician has poor access to radiological studies.

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