

Inflammatory Laboratory Tests after Joint Replacement Surgery

Kurt Kolstad¹ and Hans Levander²

¹*Department of Orthopaedic Surgery and* ²*Department of Internal Medicine, University Hospital, Uppsala, Sweden*

ABSTRACT

Objective criteria for suspected early postoperative infections after arthroplastic surgery are sparse. In order to establish the usual time course of some inflammatory laboratory values after hip and knee arthroplasty, these values were followed prospectively in nine patients. C-reactive protein in serum was normalised within about two weeks. On discharge 14 days postoperatively the erythrocyte sedimentation rate was still high (mean 64 mm/h), but at follow-up four months after operation it was restored to normal. The total blood leucocyte count remained essentially within normal limits throughout the postoperative period. The morning temperature was slightly raised, to about 38^o C in a few patients on the first and second days postoperatively, but was otherwise normal.

INTRODUCTION

Infections following joint replacement procedures constitute a major problem for the affected patient and are also an economic burden on society. It is therefore important to recognise postoperative infection at as early a stage as possible, so that early treatment can be instituted and the consequences thereby limited.

In the immediate postoperative period clinical signs of infection are extremely difficult to evaluate. Usually, after these procedures there will be postoperative swelling, some redness, tenderness, heat and reduced function in the operation area, and clinical assessment is therefore of little value in recognising infection. It seems desirable to try to identify objective criteria to facilitate the diagnosis of infection in the early postoperative period. We have therefore made a prospective follow-up study of some inflammatory variables in patients undergoing Charnley hip replacement for hip arthrosis, or arthroplasty for arthrosis of the knee, with a Freeman-Samuelsson or Marmor knee prosthesis, in order to obtain an idea of the dynamics of these laboratory variables, postoperatively. It was considered that with knowledge of the usual variation of these values any unusual deviation would indicate the presence of infection. None of the patients followed up in this way showed any signs of infection in the surgically treated joint within

the first years after operation. Hence, the present study aimed at investigating possible changes in some inflammatory variables in connection with arthroplastic surgery.

MATERIAL AND METHODS

In ten consecutive patients admitted to the Department of Orthopaedic Surgery of the Samariterhemmet Hospital during the spring of 1987, studies were made of the erythrocyte sedimentation rate (ESR), C-reactive protein in serum (S-CRP), total blood leucocyte count and body temperature before arthroplastic surgery and during the postoperative period. S-CRP was analysed by an immuno-turbidimetric method at the Department of Clinical Chemistry of the University Hospital, Uppsala (normal value < 10 mg/L) and the body temperature was measured with at Craft Temp[®] thermometer from Orion Diagnostic AB, Trosa, Sweden.

Five patients underwent total hip replacement and five patients total replacement of the knee. Nine of the ten patients were women. One female patient was excluded since she had already a high ESR preoperatively, and she was found to have chronic glomerulonephritis. The mean age of the patients was 63 years (range 49 - 80 years). The patients were operated on under epidural anaesthesia and were given Dextran 70 (Macrodex, Pharmacia, Uppsala, Sweden) for antithrombotic prophylaxis, in an amount of 1.000 ml Macrodex on the day of operation and 500 ml daily during the following three days. In the knee arthroplasty patients a tourniquet was used to induce ischaemia, the mean duration of which was 70 min. In both groups of patients Palacos cum gentamicin bone cement (Schering Corporation) was used. Cloxacillin (Ekvacillin[®]) infusion was given in a dose of 2 g x 3 during a period of 24 h starting approximately 1 - 2 h preoperatively. The patients remained in hospital for about 14 days, and the above-mentioned laboratory values were followed during this period and subsequently at follow-up approximately 4 months after operation.

RESULTS

C-reactive protein in serum.

The mean S-CRP value rose markedly up to the second postoperative day, with a maximal value of 185 mg/L (Fig. 1).

All patients showed a large postoperative increase, but there was great individual variation. On the whole, however, the values decreased very quickly and on discharge about two weeks after operation they were close to the initial value, with an arithmetic mean value of 17.5 mg/L (range: < 10 - 31 mg/L) (3). At the 4-month follow-up S-CRP was less than 10 mg/L in all patients.

Erythrocyte sedimentation rate.

The mean ESR rose to above 100 mm/h on the second postoperative day (Fig. 2).

The value then gradually decreased, but on discharge it was still clearly raised, with a mean value of 64 mm/h. At follow-up about 4 months postoperatively the values had returned to normal, with a mean value of 15 mm/h (range 2 - 22 mm/h).

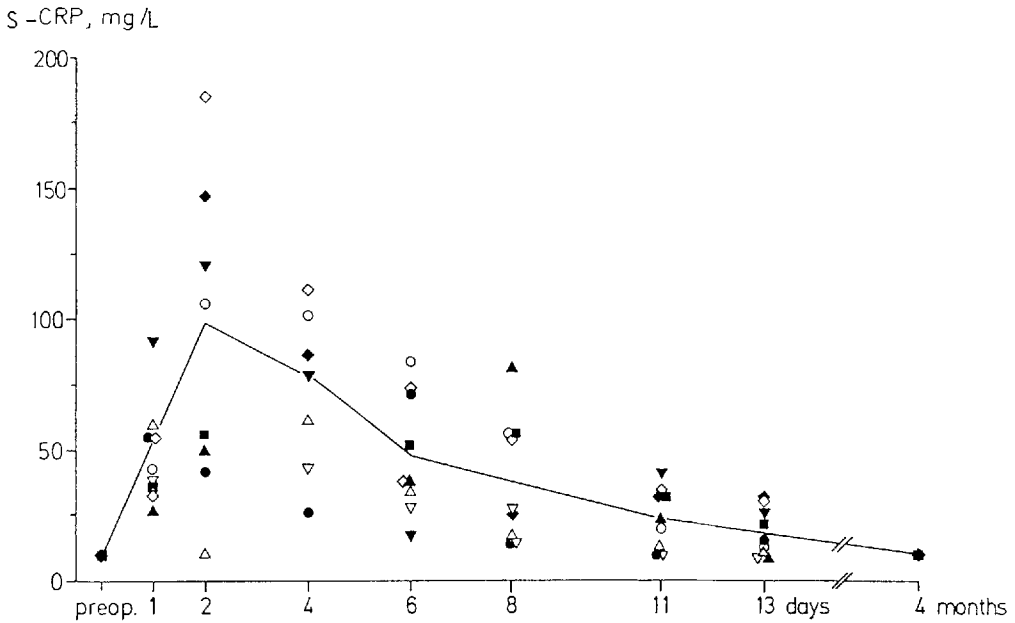


Fig. 1. Changes of C-reactive protein in serum (S-CRP) of nine patients from the day before operation to the day of discharge and at 4-month follow-up. The line represents the arithmetic mean. The patients are represented by different symbols.

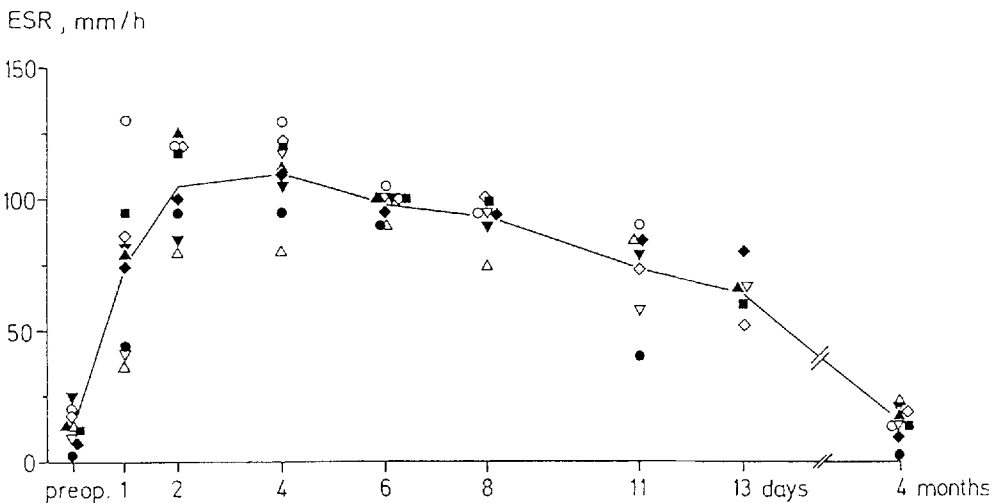


Fig. 2. Changes of erythrocyte sedimentation rate values in serum (ESR) of nine patients from the day before operation to the day of discharge and at 4-month follow-up. The line represents the arithmetic mean. The patients are represented by different symbols.

Blood leucocytes.

The total leucocyte count in peripheral blood remained essentially within normal limits throughout the observation period (Fig. 3).

Sporadic raised values were noted, without any relationship to such factors as blood transfusions (up to five units erythrocyte concentrate per day).

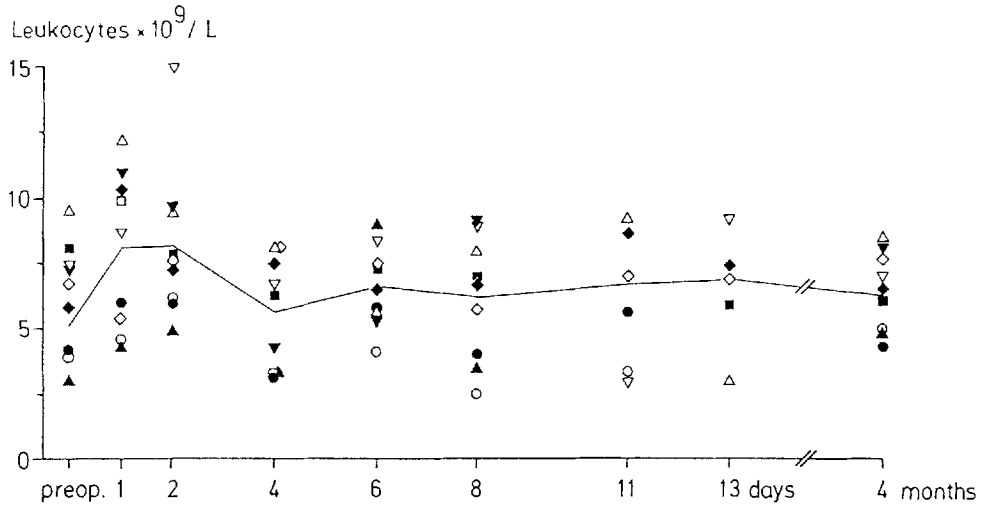


Fig. 3. Changes of total leucocyte count in serum of nine patients from the day before operation to the day of discharge and at 4-month follow-up. The line represents the arithmetic mean. The patients are represented by different symbols.

Body temperature.

On the postoperative morning temperature curves, a slightly elevated body temperature, up to 37.8° C, was noted in two patients on the first and second mornings after surgery. Otherwise the morning temperatures were normal during the period of hospitalization (Fig. 4).

At a check of the highest daytime temperature recorded, which was at 3 p.m. as a rule, it was found that about half of the patients showed a rise in temperature to about 38° C on the second day, postoperatively. The highest temperature recorded during the observation period was in a woman who had undergone hip arthroplasty, whose temperature rose to 38.3° C during the afternoon of the second day after operation.

DISCUSSION

The present study shows that S-CRP returned to normal relatively quickly in the postoperative period. It would thus seem that after two weeks S-CRP could be auxiliary to the diagnosis of infection, as previous investigations have shown that S-CRP being an acute phase reactant, will increase as a result of bacterial infections (4).

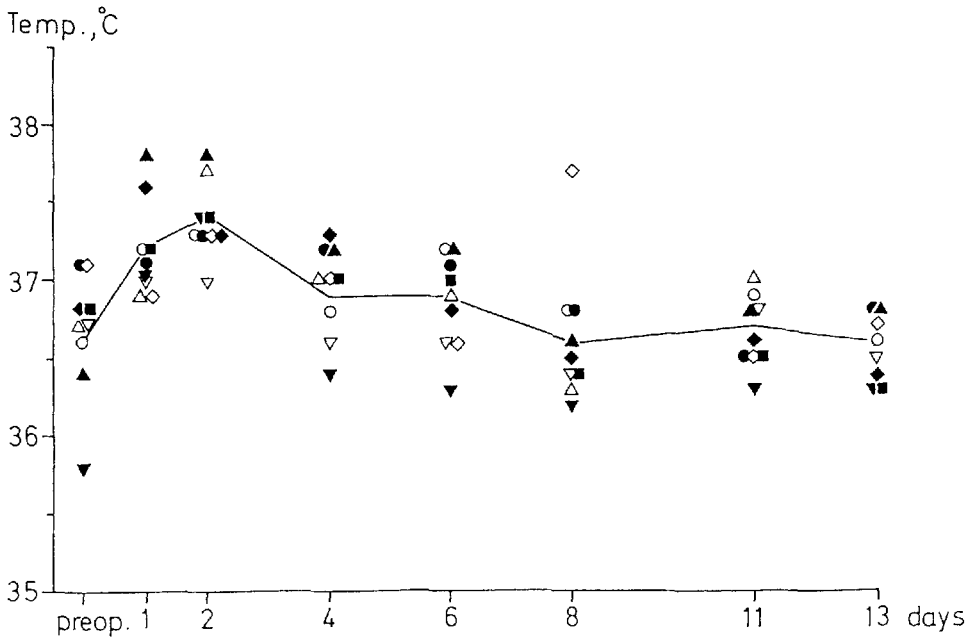


Fig. 4. Changes of body temperature in nine patients from the day before operation to the day of discharge. The line represents the arithmetic mean. The patients are represented by different symbols.

Our study, although small, did not establish any relationship between slightly elevated ESR values preoperatively and the development of a subsequent infection around the implant upto one year later. This was in contrast to the observation of Carlsson (2). ESR rose very markedly after surgery, however, probably as a result of the antithrombotic prophylaxis, which in previous studies has been found to cause an elevated ESR (5). Dextran 70 remains in the circulation for more than one day, at least after infusion (1) and some direct influence of this polymer on ESR was not unexpected in addition to the dilution effect. ESR is thus of limited value for assessment of early infections under the above conditions, i.e. when Dextran 70 was given as prophylaxis against thrombo-embolism.

The postoperative course of the leucocyte count in peripheral blood did not seem to be affected by the surgical trauma or by the anaesthesia or other drugs used in these patients. Nor did massive blood transfusion seem to affect this cell count to any appreciable extent. No differences in total leucocyte count were found between patients undergoing knee arthroplasty, with tourniquet-induced ischaemia, and those undergoing a hip replacement procedure.

The body temperature normalized within 3 - 4 days postoperatively and this variable would thus seem to be of some value in the assessment of deviations from the normal course after hip and knee arthroplasty.

REFERENCES

1. Arturson, G. & Wallenius, G.: The intravascular persistence of dextran of different molecular sizes in normal humans. *Scand J Clin Lab Invest* 1:76-80, 1964.
2. Carlsson, Å.: Erythrocyte sedimentation rate in infected and non-infected total hip arthroplasties. *Acta Orthop Scand* 49:287-290, 1978.
3. Fassbender, K., Gerber, B., Karrer, U., Sobieska, M., Aeschlimann, A., & Müller, W.: Glycosylation of acute phase proteins and interleukins following hip arthroplasty. *Acta Orthop Scand* 64(2):216-220, 1993.
4. Fasth, A. & Wadsworth, Ch.: C-reactive protein as a diagnostic tool excluding infection and differentiating between bacterial and viral infections: Clinicians' opinion on usefulness and reliability of the CRP assay. In: *Diagnosis of Infectious Diseases - New Aspects* (Ed. Simon, C. & Wilkinson, P.). Schattauer, Stuttgart, New York 327-333, 1986.
5. Rö, J.S. & Kluge, R.: Increased erythrocyte sedimentation rate following anti-thrombotic treatment with dextran. *Scand J Thor Cardiovasc Surg* 5:47-50, 1971.

Correspondence to: Kurt Kolstad, M.D.
Department of Orthopaedic Surgery
University Hospital
S-751 85 UPPSALA
Sweden