ESR, CSR, CRP

.   .

Changes of ESR, CSR and CRP after Posterior Decompression and Posterolateral Fusion of the Lumbar Stenosis

Ki-Chan An, M.D., Chang-Seop Lee, M.D. Jae-Young Choi, M.D

Department of Orthopedics, Paik Hospital, Inje University, Pusan, Korea

– Abstract –

Purpose: To help in the early diagnosis of postoperative infections in lumbar stenosis, attempts were made to evaluate a large number of patients having levels of ESR, CSR and CRP at fixed intervals, following an uncomplicated instrumented postero-lateral fusion with wide decompression.

Materials and Methods: 101 lumbar stenosis patients were included in this study. The levels of ESR, CSR and CRP were checked on the 2nd, 3rd, 4th, 7th, 10th and 14th postoperative days. These data were plotted in relation to time in order to follow their changes. The relationships between these and the perioperative factors (operation time, fusion levels, estimated bleeding amount and transfusion amount) were evaluated statistically.

Results: The ESR and CSR had peak levels by the 3rd postoperative day, which then became highly variable until 14 days. The CRP level was highest on the 2nd postoperative day, which decreased rapidly, was and reached nearly normalized levels by 14th day. The ESR and CSR values on the 7th postoperative day showed a tendency to correlate with the perioperative factors, but the CRP value showed no significant correlations.

Conclusions: Our study revealed the effectiveness of CRP, and ineffectiveness of ESR and CSR, in the early detection of deep infections following surgery for wide lumbar stenosis.

Key Words: Lumbar spinal stenosis, wide decompression, ESR, CSR, CRP

.

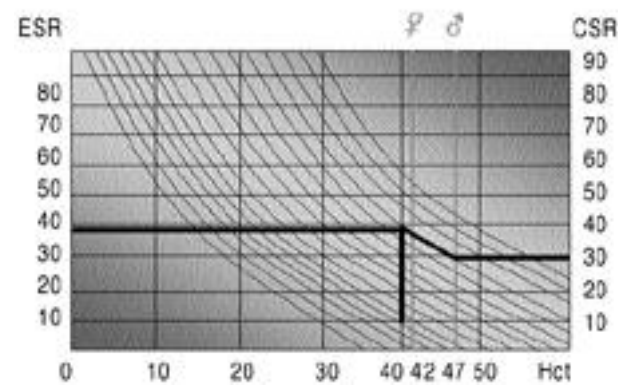.   3,22),

.

Address reprint requests to
Ki-Chan An, M.D.
Department of Orthopaedic Surgery, Paik Hospital, Inje University
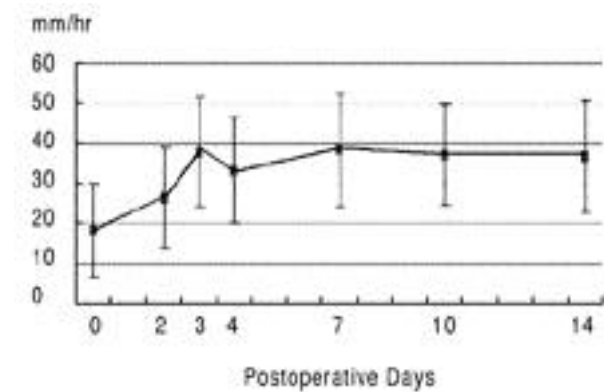633-165 Gaegum-dong, Pusanjin-gu, Pusan, 614-735, Korea
Tel: 82-51-890-6257,   Fax: 82-51-892-6619

2001   .

.

.   .

.   2

,   ESR, CSR(corrected   .

ESR), CRP

.   ESR, CSR, CRP

ESR   CRP   ,

5   ,

,   ,   .

6,13,15,22).

CRP   ESR   .

.   1996   1   2001   5

ESR   ,

ESR   CRP   101

.   1)   7

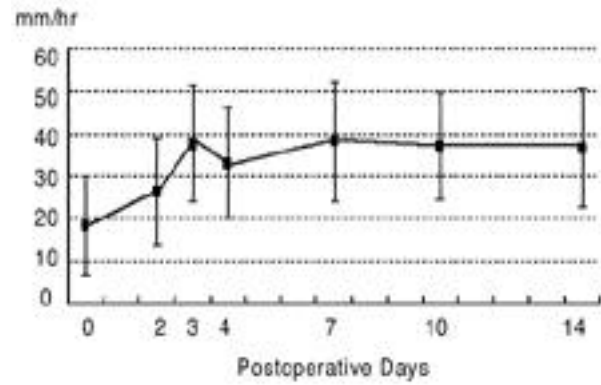ESR, CSR, CRP   , 2)

, 3)

Fig. 1. This chart shows the calculating method of CSR using ESR by adjustment of hematocrit and sex. The CSR level of a man having 35mm/hr ESR, 40% hematocit is 25mm/hr by this chart.(ref. Wintrobe MM and Landsberg JW: A standardized technique for the blood sedimentation test. J Lab and Clin Med, 19(777): 102-115, 1934.)
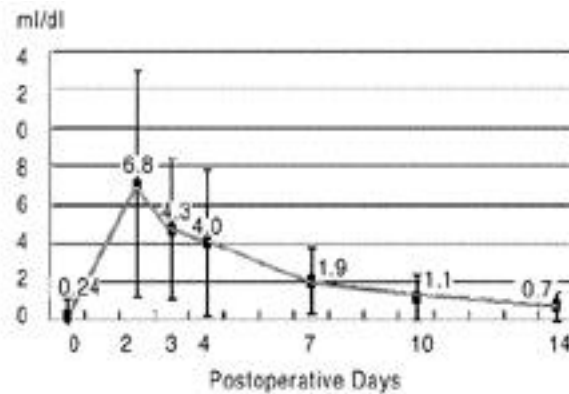

Fig. 2. Change of average ESR value in non-infected 101 cases. The elevated value of 3rd day was not decreased till postoperative 14th day.
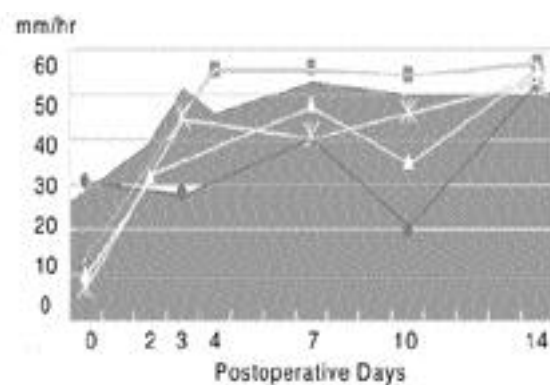

Fig. 3. Change of average CSR value in non-infected 101 cases. The elevated value of 3rd day was not decreased till postoperative 14th day.

Fig. 4. Change of average CRP value in non-infected 101 cases. The value was peak on postoperative 2nd day and decreased rapidly to near normal value on 14th day.

(Hemo-vac)
, 4) ESR, CSR, CRP
(, ,
), 5) 5 38.3 ( )
, 6)
( ) 7)
5
.

55.28 (29~74) , 36 65
. 1.89 (1~4) . 1
33 , 2 49 , 3 16 , 4 3
.

,
20 .
28 .
2, 3, 4 7 , 10 , 14 ESR, CSR
CRP .
2, 4, 7, 10, 14 3
,
, ( )
,
14 10 14
. , 7
101 , 2 , 3
, 4 72 , 30 , 66 ,
10 14 93 82 .
ESR modified Wintrobe-Landsberg
(15 mm/h, 20), CSR
(hematocrit)

ESR (Fig.1), CRP tur-
bidimetry (Cobas Integra 700)
(<0.5 ml/dl). ,
, , ,
( ),
4
(+1)
.
199 (± 44),
1603 cc(± 830) ,
874 cc(± 533) , 2479 cc(± 1018),
2035 cc(± 1173) .
4.27 (± 2.18) .
SPSSwin 8.0
ESR, CSR, CRP Pearson
. P 0.05
.

ESR 17.9 mm/h(± 11.4,),
2 25.9(± 12.1), 3 35.6(± 14.6), 4 33.1(±
12.9), 7 37.2(± 14.6), 10 35.9(± 13.1), 14 35.4(±
14.3) 3 14
(Fig. 2). CSR 9.5 mm/h(±
9.2), 2 10.2(± 8.1), 3 17.2(± 11.7), 4 17.1(±
9.9), 7 18.4(± 10.4), 10 17.4(± 10.1), 14 15.8(±
11.1) ESR (Fig. 3). CRP

Fig. 5. The serial ESR plottings of infected 4 cases. The ESR value of non-infected with 1 standard deviation (grayish area) was not effective in early detection of deep infections.
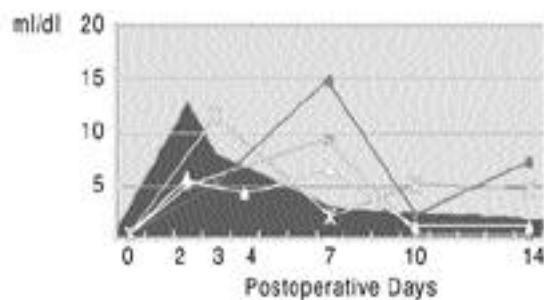
Fig. 6. The serial CRP plottings of infected 4 cases. There were abrupt re-elevations on 7th day (3 cases) or 10th day (1 case). The CRP value of non-infected was effective in early detection of deep postoperative infection. The gray colored area means CRP value of non-infected cases with 1 standard deviation.

Table 1. Statistical correlations with perioperative factors on postoperative 7 day

Postop. 7th day	Op. time	Fusion level	Intraop. bleeding	Total Transfusion
ESR	0.282*	0.255*	0.201*	0.256*
CSR	0.239*	0.291*	0.144	0.203
CRP	0.079	0.171	0.057	0.102

*Correlation is significant (p<0.05)

0.2 mg/dl(± 0.8),　　2　6.8(± 5.8), 3　4.3(± 3.6), 4
4.0(± 5.7), 7　1.9(± 1.7), 10　1.1(± 1.1), 14　0.7(±
0.8)　　　,　2　　　　　　　　,
　14　　　　　　　　　　　　　(Fig. 4).
　　　　　　7　　ESR　　　　　(r=0.282),
　　　(r=0.255),　　　　　　　　(r=0.201),
　(r=0.256)　7　　CSR　　　　　(r=0.239),
　(r=0.291)　　　　　　　　　　　　　,
CRP　　　　　　　　　　　.
　　　　　　　　4　　　　　　　ESR
CSR　　　1　　　　7　　10
　　　, 2　　10　　　　　　14
　　　　　,　　1
　　　(Fig. 5).　　CRP
　　　　　　　　7　(3　)
10　(1　)　　　　　　　　1
　　　(Fig. 6).

, Peltola[18]　　　20~25 mm/hr,　　　　[14]
20 mm/hr　　,　　　　[17]　20~30 mm/hr, Wintrobe
Landsberg[24]　　　　　　　　　　　0~9
mm/hr,　　　　　0~20 mm/hr
　, modified Wintrobe-Landsberg
　　15 mm/hr　,　　　　　　20 mm/hr
　　　　　　.　　　　　ESR
　　　　　screening

　　　　　　　　　　　　　Curtiss[5]
　　　　　　　　　　　　　　ESR
, Harris[9]
　　　　ESR
ESR　　CRP

CSR　ESR

　　　　　　ESR
　　　　　　,
　　　　　[24].

　　　　CSR　　　ESR
　　　　　　　　　,

ESR, CRP
　.
ESR　fibrinogen　　globulin　　,

Bottiger　Svedberg[2]　50
15 mm/hr,　　　　20 mm/hr　　, 50
　20 mm/hr,　　　　30 mm/hr

ESR
(acute reactive
protein)-Ceruloplasmin, C3(complement component),　1-
acid glycoprotin,　1-Antitrypsin, haptoglobin, Fibrinogen,
Leukocyte protein L1, CRP　-
, Fischer　Gill[7]　CRP
.　　　[11]　CRP　ESR
, Peltola　[18]　CRP

tion),   (fusion into the sacral region),
,   (failure to use antibiotics)

CRP   ,

1,7,16,23).   Peltola19)   ·   -   ,   ,
Benjamine   8)   ,   -   ESR, CSR, CRP
CRP   .
  CRP   ESR   10), CRP
LEM(Leukocyte Endogenous Mediator)   prostaglandin-   . Jonsson
E1   10)   ESR   ,   4
                                          ESR   14
    (recognition)   ,   ,   ,   ,
            (activation)   21).   . Thelander
                                          6~12   Larsson22)   ,
                24~48   CRP   3
                (,   ,   14
    ,   , Amyloidosis, Reiter   )   , ESR   5
1000   18,12,21).   ,   3~6
    CRP   1930   Tillett   Francis22)   .
(pneumococcus)   CRP
                                                                                              ,
                    12,21), Colley4)   Pepys21)   1 mg/dl   ESR   CRP
            ,   11)   1 mg/dl   .
                    , 1   10 mg/dl   17
    , 10 mg/dl   .
    . CRP   101   ESR   CRP
                    24   ,
            ,   .
                    CRP   ESR   CSR   3
                    11,20).   ,   14
                                                                              .
Brown   Eismont3)
        (procedure)   (complexity)
    ,   0.9~5%(2%),   ,   4.27   (± 2.18)
                    0.11~10%(7%)   .
            .   ESR   Hb

                                                                                              .
        Self-retaining retractor   Pearson
                                          0.3
                    .   CRP   2
        ,   ,   , steroid   ,   ,   ,
    ,   ,   (,
    ),   ,   ,   . Thelander   Larsson22)
        ,   (air borne contamina-

,

.

.   ,   5

,   ESR,

CSR, CRP

,

.

ESR, CSR

14

, CRP

2

7   10

.

REFERENCES

1) **Aalto K, Osterman K, Peltola H and Rasanen J**: *Change in erythrocyte sedimenation rate and C-reactive protein after total hip arthroplasty. Clin Orthop, 184: 118-120, 1984.*

2) **Bottiger LE and Svedberg CA**: *Normal erythrocyte sedimentation rate and age. Br Med J, 2:85-89, 1967.*

3) **Brown CA and Eismont FJ**: *Complication in spinal fusion. Orthop. clin. of north america, 29(4): 679-699, Oct 1998.*

4) **Colley CM, Fleck A, Coode AW, Muller BR and Myers MA**: *Early time course of the acute phase protein response in man. J Clin Pathol, 36: 203-207, 1983.*

5) **Curtiss PH**: *Bone and joint infection in childhood. Instructional Course Lectures. The American Academy of Orthopedic Surgeons, 26: 14-19, 1977.*

6) **Deyo RA, Cherkin DC, Loeser JD, Bigos SJ and Ciol MA**: *Morbidity and mortality in association with operations on the lumbar spine. J Bone Joint Surg, 74-A(4): 536-543, 1992.*

7) **Fisher CL, Gill C, Forrester MG and Nakamura R**: *Quantitation on acute phase proteins posoperatively. Value in detection and monitoring of complications. Am J Clin Pathol, 66: 840-846, 1976.*

8) **Gewurz H**: *Biology of C-Reactive Protein and the Acute Phase Response. Hospital Practice, June: 67-81, 1982.*

9) **Harris NH**: *Some problems in the diagnosis and treatment of acute osteomyelitis. J Bone Joint surg, 42-B: 535-541, 1960.*

10) **Jonsson B and Bjorn stromqvist**: *Erythrocyte sedimentation rate after lumbar spine surgery. Spine, 16(9): 1049-1050, 1991.*

11) **Jung SH and Shim BS**: *C-reactive protein and acute response. Medical Postgraduates, 6(18): 261-266, 1990 ; from Irving Kushner: Hospital practice, 25(3A): 13-28, 1990.*

12) **Kushner I and Gewurz H**: *C-reactive protein and the acute phase response. J Lab Clin Med, 97: 739-749, 1981.*

13) **Larsson S, Thelander U and Friberg S**: *C-reactive protein(CRP) levels after elective orthopedic surgery. Clin Orthop, 275: 237-242, 1992.*

14) **Lee HK, Ahn BW and Song HS**: *Clinical observations on acute pyogenic osteomyelitis and arthritis in infancy. J of Korean Orthop Surgery, 12:735-745, 1980.*

15) **Mcdonnell MF, Glassman SD, Dimar JR, Puno RM and Johnson JR**: *Perioperative complication of anterior procedures on the spine. J Bone Joint Surg, 78-A(6): 839-847.*

16) **Mustard RA Jr, Bohnen JMA, Haseeb S and Kasina R**: *C-reactive protein levels predict postoperatice septic complications. Arch Surg, 122:69-73, 1987.*

17) **Park BM and Choi YK**: *A clinical study of septic arthritis in children. J of Korean Orthop Surgery, 12:746-753, 1980.*

18) **Peltola H, Vahvanen V and Aalto K**: *Fever, C-Reactive protein, and Erythrocyte Sedimentation Rate in Monitoring Recovery from Septic Arthritis: A Preliminary Study. Journal of Pediatric Orthopedics, 4: 170-174, 1984.*

19) **Peltola HO**: *C-reactive protein for Rapid Monitoring of Infection of the Central Nerve System. The Lancet. May 1, 1982.*

20) **Pepys MB**: *Acute Phase Response and C-Reactive protein. Oxford Textbook of Medicine, second Ed. pp 157-164, Oxford University Press, Vol. 1-Sectionas 9, 1987.*

21) **Pepys MB**: *C-reactive protein fifty years on. Lancet, 1: 653-657, 1981.*

22) **Thelander U and Larsson S**: *Quantitation of c-reactive protein levels and erythrocyte sedimentation rate after*

spinal surgery. Spine, 17(4): 400-404, 1992.

23) **Verkkala K, Valtonen V, Jarvinen A and Tolppanen E-M**: *Fever, leucocytosis and C-reactive protein after open-heart surgery and their value in the diagnosis of postoper-*

ative infections. Thorac Cardiovasc Surg, 35:78, 1987.

24) **Wintrobe MM and Landsberg JW**: *A standardized tech-nique for the blood sedimentation test. J Lab and Clin Med, 19(777): 102-115, 1934.*

:   ESR, CSR (corrected ESR), CRP

                    .

          :

          101   2, 3, 4   7 , 10 , 14   ESR, CSR   CRP
                    .   ·   (,   ,   ,   )
                              .

    : ESR   CSR   3   14   CRP   2
      ,   14   .   7   ESR   CSR   ,
                                , CRP   .

    : CRP   ESR, CSR   2
                                                              .

─────────────────────
        :   ,   , ESR, CSR, CRP

        :
                      633-165

Tel: 82-51-890-6257,   Fax: 82-51-892-6619