Original Article

# Postoperative discitis following single-level lumbar discectomy: Our experience of 17 cases

*Saumyajit Basu, Jay Deep Ghosh, Farid H Malik, Agnivesh Tikoo*

## Abstract

**Background:** The established protocols of treatment of postoperative lumbar discitis have not been validated till date. We report a retrospective analysis of a series of patients with discitis following single level lumbar discectomy. We analyzed the outcome of conservative treatment of postoperative discitis with the objective to define when and what surgery was required when the conservative treatment failed.

**Materials and Methods:** A total of 17 cases of postoperative discitis treated from 2002 to 2009 were followed up and evaluated clinically, radiologically and by laboratory investigations. All the patients were treated initially conservatively with rest and antibiotic therapy after diagnosis and those who did not respond to conservative treatment of at least 4 weeks were treated surgically. The cases were followed up with serial C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), X-ray, computed tomography (CT) scan and magnetic resonance imaging (MRI) for at least 1 year.

**Results:** The mean followup was 40.38 months (range 12-86 months). Four cases failed to respond to conservative therapy and were treated surgically. In three of these four cases, open debridement, transpedicular fixation and posterolateral fusion was performed, and in the fourth case percutaneous transpedicular fixation was done. In the former group, one case was diagnosed to be tubercular, in another case *Staphylococcus aureus* was cultured where as the third case culture was sterile. All operated patients showed evidence of interbody fusion at 1 year followup.

**Conclusions:** Early detection and aggressive treatment are paramount in managing postoperative discitis and the majority do well with conservative treatment. Surgical management in the form of transpedicular fixation and debridement, when required, gives excellent results.

**Key words:** Disc space infection, discitis, lumbar discectomy, postoperative discitis

## Introduction

Postoperative discitis (POD) was first described as a clinical entity by Turnbull in 1953 and it is defined as primary infection of the nucleus pulposus with secondary involvement of cartilaginous endplate and vertebral body following lumbar discectomies[1] [Figure 1]. It is controversial whether discitis can be caused by an aseptic or infectious process and positive cultures may be obtained only in 42–73% of patients.[2,3] Early diagnosis is crucial in the management of discitis because delayed treatment can lead to increased morbidity and mortality.[4,5] The mainstay for discitis treatment is a combination of bed rest and prolonged administration of antibiotics; surgical intervention is occasionally necessary in patients failing conservative treatment.[6-10] The duration of medical therapy is variable. Six weeks of intravenous antibiotics followed by an additional 6 weeks of oral antibiotics is the course commonly administered.[1,6,8,11-14] The prolonged period of strict bed rest and antibiotic treatment can last up to several months and this might lead to undesired medical and psychosocial effects.[1,15,16] The present study is a retrospective analysis of a series of patients with discitis following single-level lumbar discectomy treated conservatively.

We analyzed the outcome of conservative treatment of postoperative discitis with the objective to define when and what surgery was required when the conservative treatment failed.

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|---|---|
| Quick Response Code: | Website: www.ijoonline.com |
| | DOI: 10.4103/0019-5413.98831 |

## Materials and Methods

Seventeen patients of POD presented with excruciating

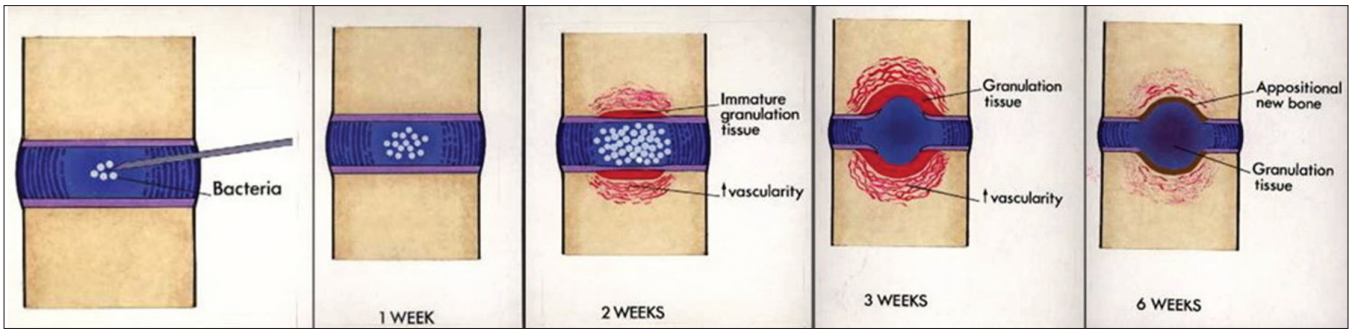


**Figure 1:** Pathogenesis of postoperative discitis: (left to right) Inoculation of bacteria into the disc space → bacteria proliferating (1 week) → increased vascularity and early granulation tissue formation in the vertebral endplates (2 weeks) → granulation tissue formation (3 weeks) → appositional bone formation starts and granulation tissue invades the disc space (6 weeks)

back pain were admitted after 2–6 weeks of single-level lumbar discectomy done either in our hospital or elsewhere. On examination they had severe restriction of movements and of straight leg raising (SLR). Blood parameters [complete blood count (CBC)/erythrocyte sedimentation rate (ESR)/C-reactive protein (CRP)], X-rays, computed tomography (CT), and magnetic resonance imaging (MRI) were serially done for diagnosis and evaluation of response to treatment. Initially all patients were treated with intravenous antibiotics empirically for 3 weeks (Vancomycin/Cefipime/Linezolid) for Gram-positive organisms, along with Amikacin/Netromycin/Quinolones for Gram-negative coverage and Metronidazole/Tinidazole for anaerobic coverage) followed by oral antibiotics for another 3 weeks along with rest and analgesics.[17] The choice of antibiotics was guided by the antibiotic susceptibility of organisms in our hospital, recommended by a microbiologist. The response of treatment was evaluated after 3 weeks clinically and by laboratory investigations. The conservative treatment was continued when pain reduced and CRP showed a downward trend failing which the patients were taken up for surgery. The surgical plan was posterior approach surgery with combination of debridement and fixation or fixation alone.

All patients were followed up after discharge at 1, 3, and 12 months, and then yearly thereafter. Repeat X-rays and blood investigations were done in all followups. CT and/or MRI were done in some of the patients. The symptomatic improvements, radiological healing, and return to work was noted during the followup visits.

## Results

Seventeen patients (10 males and 7 females) were followed up for a mean period of 44.53 months (range 12–86 months). The mean age was 38.3 years (range 18–74 years). Mean interval between discectomy and establishment of diagnosis was 4.8 weeks (range 2–12 weeks). Of the 17 patients, 12 underwent their index surgery (discectomy) at our hospital and the remaining were operated at a different hospital and were subsequently referred to our hospital. Five out of 17 (29%) patients presented with symptoms of discitis in the first 2 weeks and 3 patients out of these 5 were diabetic. There were no other co-morbidities like rheumatoid arthritis, immunosuppression, collagen vascular disorders, widespread malignancy, or steroid intake in any other case.

All patients had severe back pain. The mean Visual Analogue Scale (VAS) score was 8.8. Pain was described as continuous and deep seated which frequently increased in the morning in 15 cases (88.24%). Back pain was accompanied by severe paravertebral muscle spasm in 13 cases (76.4%) and was radiating into the buttocks, thighs, groin, perineum, or the abdomen. Pain aggravated on turning in bed or during any attempts to examine the patient. There was no neurological deterioration. Passive straight leg raising tests were positive at 30°–45° and it could not even be tested in some of the patients. Surgical skin incision appeared to heal uneventfully in all but one patient where persistent wound discharge started after 7 days and it stopped after local debridement. In all other patients, local erythema, swelling, or a draining sinus was not seen. Fever (usually low grade) was present in only 9 out of 17 (54.5%) patients.

The mean ESR was 67 mm (range 42 -110 mm FHR. The mean CRP was 41 mg/L (range 15-125 mg/L) with normal value as 6 mg/L. Seven of 17 patients (41%) had WBC counts above 11,000/mm$^3$.

Plain radiographs obtained earlier showed little evidence of discitis, however, after 6–8 weeks showed decreased disc height and endplate irregularities. CT in all 17 cases (100%) showed endplate erosions which was present as early as 3–6 weeks [Figure 2]. In 3 cases, (17.65%), CT scan showed small abscess formation [Figure 3]. The characteristic MRI findings of discitis in the acute stages, found in all the patients,was low signal intensity on T1 and

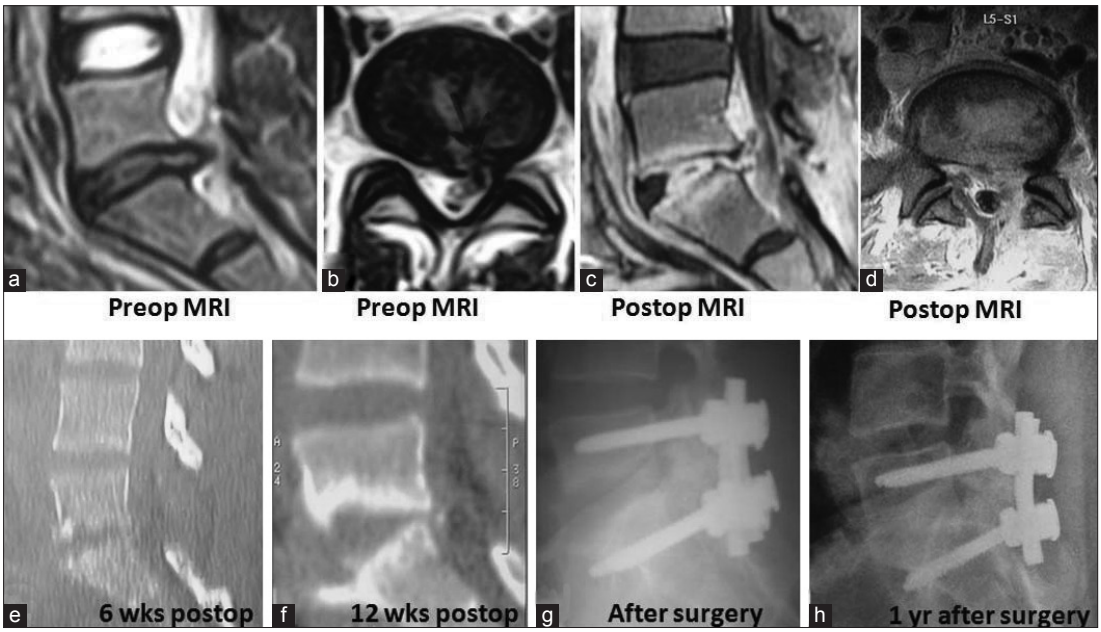


**Figure 2:** MRI scans of patient with postoperative discitis – preoperative T2-weighted sagittal and axial views (a,b) showing L5/S1 (L) sided disc prolapsed. Postoperative T1-weighed sagittal (c) and axial views (d) postoperative infective changes in the disc space with evidence of decompression. Sagittal reconstruction CT scan (e) showing endplate changes and erosion due to increased vascularity and granulation tissue (6 weeks) and at 12 weeks (f) shows sclerotic changes in endplates along with increased destruction. Immediate (g) and 1 year postoperative lateral skiagram (h) after transpedicular fixation showing spontaneous fusion in the vertebral bodies (L5/S1)

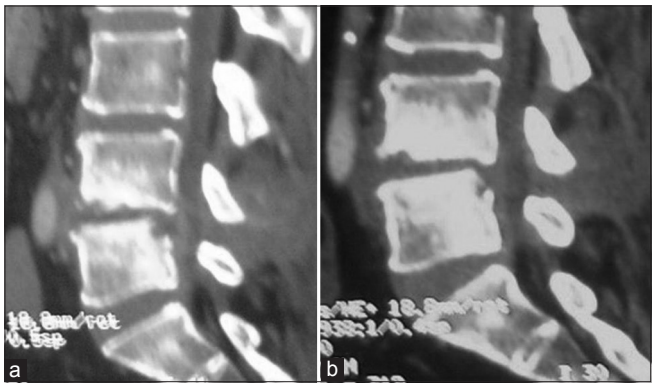


**Figure 3:** (a) Discitis with anterior abscess and small disc space abscesses; (b) 1 year followup CT sagittal reconstruction showing resolution

high signal intensity on T2-weighted images present in the involved disc space and the adjacent vertebral bodies.[18,19] All the patients received intravenous gadolinium which resulted in homogeneous enhancement of the same areas. On MRI, adjoining vertebral body edema was also present in all of patients.

In a patient presenting with severe pain after a pain free interval following lumbar dissectomy, the possibility of recurrent disc should be considered. The MRI features of recurrent disc are that it has a smooth polypoid or lobulated margin which is generally contagious with the disc or may be a free fragment. It exerts a mass effect on the thecal sac or the nerve roots and rarely enhances peripherally on gadolinium contrast.[18] By comparison, the postoperative scar tissue is irregular, does not have a mass effect, is noncontagious with the disc, and enhances brightly with contrast.[18,19]

The percutaneous biopsy to isolate the organism was not performed. In one case there was postoperative wound healing problem and discharge after dissectomy (day 7) and underwent debridement and secondary closure. This case showed the growth of Pseudomonas aeruginosa from the wound biopsy and this case subsequently developed symptoms of discitis and was treated by antibiotic regimen according to culture sensitivity. Out of the four surgically treated cases, three underwent open debridement procedures and disc space sampling revealed no growth in one, *Staphylococcus aureus* in another, and *Mycobacterium tuberculosis* in the third case. The fourth case was operated by percutaneous technique without debridement.

Thirteen out of 17 patients (76.47%) improved with conservative treatment and were gradually mobilized out of bed with a brace after 3–6 weeks depending upon pain relief, and oral antibiotics were continued for another 3 weeks after IV antibiotics were stopped. They were regularly followed up with serial blood tests/X- ray after 1, 3, 12 months after discharge, and yearly thereafter [Figure 4].

None of the patients during the conservative treatment suffered neurological deterioration, though two patients had complications of antibiotic therapy one (5.8%) had

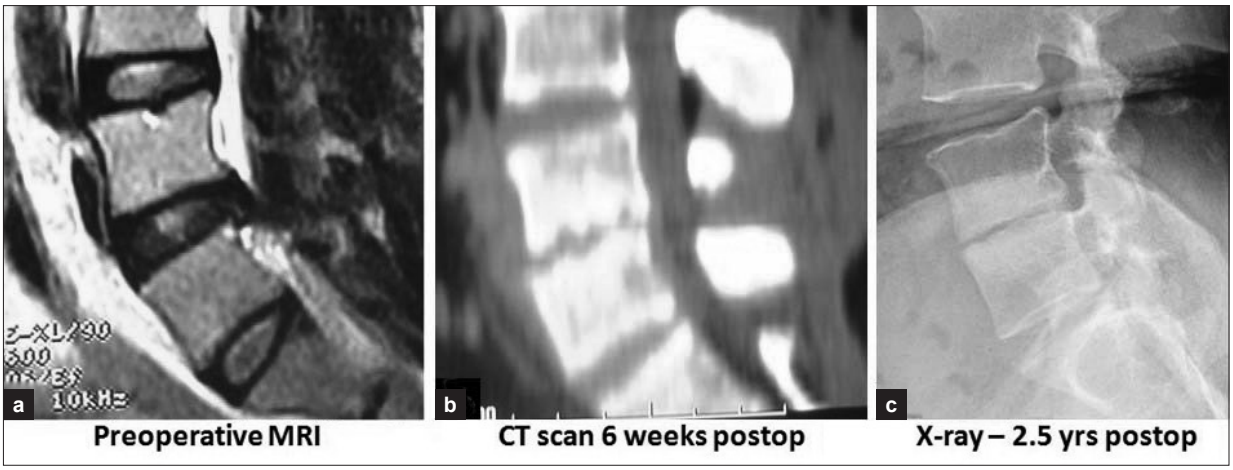


**Figure 4:** (left to right) Preoperative T2 sagittal MRI (a), sagittal reconstruction CT scan (b) and lateral skiagram (c) at 2.5 years showing good healing with conservative treatment

drug induced hepatitis and another (5.8%) had renal problems(increased serum urea and creatinine), both of which gradually improved after changing the drug regimen over a period of 6 weeks. In 11 patients (64.71%) elevated CRP values returned to the preoperative baseline values within 8–30 days (mean 21 days) after initiation of the treatment. The mean immobilization time was 4 weeks (range 21–45 days). After completion of the treatment, the patients were discharged in a satisfactory condition with regards to pain and mobility. The mean VAS at discharge was 2.2.

There were four cases who remained symptomatic even after 3 weeks of conservative treatment, and hence they were treated surgically. Three out of these four cases underwent thorough debridement in addition to instrumented posterolateral fusion. The cases were operated by standard posterior midline approach with bilateral exposure. All the infected detritus was removed by washing and curettage. The nerve roots were cleared of unhealthy granulation tissue. Curretage and washing of disk space was done. In all the three cases, tissue obtained was sent for HPE, gram/acid-fast bacillus (AFB) staining and culture. The histological features of all three showed fragmented bony bits and had no diagnostic features. In one patient *S. aureus* was isolated, and mycobacterium tuberculosis in another who was treated by ATT for 1 year. All three got relief from symptoms within 1-2 days after surgery and were mobilized within 48 hours after surgery. They underwent posterolateral fusion with local bone mixed with beta tricalcium phosphate (β-TCP) and all three showed evidence of spontaneous solid interbody fusion by 1 year [Figure 2]. We performed a percutaneous transpedicular fixation in the 4$^{th}$ patient and the same results of immediate pain relief leading to mobilization out of bed and spontaneous fusion were achieved. There was no debridement done anterior or posterior in this case. None of the surgically treated patients had any complications of wound healing or neurological deterioration.

## Discussion

Discitis is considered to be a serious complication of lumbar disc surgery. It can be septic or aseptic but recent data suggest that POD is mainly bacterial.[11,20-22] The majority of surgeons are of the opinion that it results from direct inoculation of an offending pathogen into the avascular disc space.[21,22] The clinical manifestations of postoperative disc space infection have followed a very similar pattern as per the available existing literature.[21,23,24] The usual clinical presentation is severe recurrent back pain after the initial relief of symptoms following surgery, but the duration of the postoperative pain relief period is variable ranging between a few days to 10 weeks after surgery.[11,24-26] In the present study, the mean interval between surgery and the onset of symptoms was 21.3 days (range 8–77 days). The delay in diagnosis may be because the treating physician attributes these symptoms to recurrent disc herniation, unsatisfactory outcome of surgery, or psychoneurotic disorders.[8,23,27,28] The early and accurate diagnosis frequently depends on a combination of clinical, laboratory, and imaging findings. The diagnosis is strongly suggested by a persistently elevated ESR, CRP values, and by typical changes on MRI.[6-8,15,16,23,28,29] Although elevation of the ESR and CRP is almost uniformly present in discitis, they are supportive but not confirmatory of the diagnosis.[6,28,30] It is to be noted that postoperative rise in CRP usually comes down by about 10 days while ESR takes about 3–6 weeks to come down. Hence, unexplained rise in CRP values any time beyond 2 weeks of surgery should be viewed with suspicion. However, these are very useful parameters for following the response to therapy.[16,23,24] In the current series of patients, all of them had an associated elevation of the ESR and CRP level at the time of diagnosis.

During the course of antibiotic, all the patients had a steady decline and the values returned to preoperative baseline values within 8–30 days (mean 21 days). The decline of ESR and CRP values significantly correlated with the clinical improvement. The key to accurate and early diagnosis is clinical suspicion. MRI has established to be the imaging modality of choice in diagnosing POD, with a reported sensitivity and specificity of more than 92%.[7,15,24] We could not identify any risk factors in the cases that underwent the index surgery in our institute.

Fusion may not be needed in all cases, but the nature of the pain (turning in bed, sitting/standing up leads to severe pain) is highly suggestive of mechanical instability. Also, it is very difficult to prove instability by dynamic X-rays in a patient suffering from severe low back pain. Debridement and fixation with posterolateral fusion results in spontaneous anterior interbody fusion (which is accelerated if a disc space debridement is done). The problem of instability is in the intermediate period and it brings along with it pain which may upset the patient greatly.

There have been various reports in literature for CT-guided aspiration of the disc and culture sensitivity, but enthusiasm for this technique is tempered by the fact that there is low yield in such aspiration. Moreover, we should not neglect the possibility of aseptic discitis or chemical discitis.[16] In a comparative study done for identification of causative bacteria by Yang *et al.*, after spondylodiscitis, they were identified more frequently with percutaneous endoscopy than with CT-guided biopsy [18 of 20 (90%) vs. 15 of 32 (47%)], indicating poor diagnostic yield with simple aspiration of the disc space.[31] In a series evaluating the result of hyperbaric oxygen in 22 patients by Kutlay *et al.*, blood cultures were positive in only 36% of the patients.[32] They did not do any needle biopsy in their series and they also started Vancomycin antibiotic empirically for 4 weeks. Sakeni *et al.*, in their article from an economically disadvantaged area like India, have recommended early MRI and empiric antibiotic therapy in infectious discitis cases.[33] So, prophylactic antibiotic is an established treatment method in discitis.

There are technical problems with aspiration as the aspiration of disc space by thin bore needle might not yield any infected material. Aspiration of any paravertebral abscess if present is easy and generally yields samples for microbiology, but it is rare that any paravertebral abscesses form in the early stages of POD. There are also problems with mixed infections especially with anaerobes and it is difficult to diagnose all the organisms present at the infected site.

Review of literature does not reveal the presence of any randomized trial in relation to discitis,[34] which only highlights the rarity of the disease process and technical difficulties in conducting randomized control trial. The management of discitis is a challenge and matter of controversy[6,11] and there is no universally accepted treatment protocol. The mainstay for discitis treatment is a combination of bed rest and prolonged administration of antibiotics (4 weeks to 6 months).[1,6,8,10,13] Though conservative treatment along with spinal immobilization has been shown to produce good longterm outcomes in the majority of patients, the period of strict bed rest can last up to several months and might lead to dramatic medical and psychosocial consequences.[7,8,11,25] Additionally, major complications (e.g. colitis, renal failure, allergic reactions) as side effects of longterm antibiotic therapy were also reported.[35] In our study, antibiotics related complications were noted in two cases. One had a renal problem and the other had a drug induced hepatitis. The latter patient ultimately failed conservative trial and percutaneous transpedicular fixation was done. The drug related adversities reversed within 6 weeks with change of antibiotics.

Systemic antibiotics have been advocated in the literature to be administered by IV infusion for a minimum of 4–6 weeks, followed by oral administration for a further 2–3 months.[6,7,11,24,25,35] Parenteral therapy for less than 4 weeks results in a higher rate of failure.[6-8,11,24,25,35] The main difference between our study and those reported in the literature is the reduced duration of antibiotics and early surgery in case the patient did not respond to conservative treatment.

We felt that anterior surgery in POD at L4/5 and L5/S1 would be technically quite difficult and the disc space could be approached from the back more easily. Morbidity of anterior surgery is thus avoided. Instrumentation of the spine is safe and has an important role in stabilization of the infected spine.[36-38] Despite the presence of active infection, we believe that instrumentation after radical debridement will not increase the risk of recurrent infection. In fact, greater benefit can be achieved through spinal stabilization, which can even promote accelerated healing.[36] Some authors advocate the use of percutaneous endoscopic biopsy of the disc space to search for the definitive pathogen and thus enhance the efficacy of antibacterial treatment.[8,16,25] A positive culture from the material obtained by percutaneous needle biopsy, is reported to occur in only 50–70% of cases.[6,8,23,24] Of those that are positive, over 90% grow a *Staphylococcus* species, which are found in up to 100% of cases in some studies.[6,8,11] In our series, we did not go for isolation of the organism, but straight away went for broad-spectrum IV antibiotics with known efficacy to *Staphylococcus* and other commonly found microbials (Staphylococcus epidermidis, and β-hemolytic Streptococci,

Klebsiella pneumoniae, *Escherichia coli*, Pseudomonas aeruginosa, Proteus Propionibacterium acnes and diphtheroids).[19] Culture and biopsy were only obtained in patients who underwent open surgery as mentioned above.

The overall longterm prognosis of discitis varies markedly in different series; different authors report variable success in patients returning to work. The percentage of patients who were unable to resume their former work varied from 12 to 90%.[7,8,11,24] In our series all patients returned to work and were able to perform all activities of daily living.

## Conclusion

A high index of suspicion, unexplained pain after 1–6 weeks of surgery, persistently raised CRP, corroborative X-ray/MRI/CT features are the important parameters for the diagnosis of POD. Rest and aggressive antibiotic therapy (IV for 3 weeks followed by oral for the next 3 weeks) should be the mainstay of therapy and is successful in most of the cases. Following failure of conservative treatment of at least 3 weeks, surgical option is worth considering. Careful re-exploration, debridement, and transpedicular fixation and posterolateral fusion is usually sufficient, and spontaneous interbody fusion is the natural outcome within a year. The possibility of percutaneous transpedicular fixation is worthy of consideration. The overall prognosis of the clinical entity of POD is good with all patients returning to work without any longterm disability.

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**How to cite this article:** Basu S, Ghosh JD, Malik FH, Tikoo A. Postoperative discitis following single-level lumbar discectomy: Our experience of 17 cases. Indian J Orthop 2012;46:427-33.

**Source of Support:** Nil, **Conflict of Interest:** None.