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Post-Discectomy Pyogenic Lumbar Discitis: A Literature Review

Udit D. Patel[1], Hitesh N. Modi[1]

Abstract

Introduction: Development of spondylodiscitis after discectomy is not common condition but its presentation is typically non-specific, which can lead to delay in diagnosis and its treatment. Patients with development of postoperative discitis experience back pain after a symptoms free period. The diagnosis can be established with symptoms and signs, laboratory studies and radiographic investigations.

Purpose: The purpose of this review is to assess available papers on post-discectomy lumbar spondylodiscitis. we explore the rate of incidence, pathology, management (diagnosis and treatment) and prevention strategies for postoperative disc space infection in the published literature.

Material and methods: We have evaluated all English-language literature publications on the subject of post-discectomy lumbar discitis that have been published since 2000 in PubMed, MEDLINE, and Google Scholar.

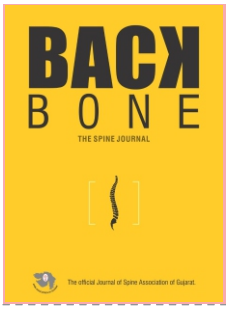
Results: The incidence rate is 0.94% for POD in our study. Mean age was 45.18±4.17 (38 to 56) years. It took an average of 2 to 8 weeks from the discectomy to the diagnosis being made of spondylodiscitis. 61.93% of the patients included were males, whereas 38.07% patients were females. The most common organism isolated is staph. aureus (including methicillin sensitive and resistant staph. aureus). Majority of patients were initially treated conservatively and the patients who did not recover with conservative management, underwent surgery. The surgical treatment in patients who fail to respond to conservative management has been demonstrated. Our study showed excellent result in 40.1% of patients, good result in 56% and fair and poor result in 3.9%.

Conclusion: Although, the incidence of post-operative lumbar discitis is rare, it's associated with morbidity and mortality. Establishing a prompt diagnosis for post-operative discitis is an actual concern. The vast majority of patients may be managed conservatively, and surgical intervention is very rarely required in individuals who have not responded to conservative therapy.

Keywords: Post-disctectomy, Pyogenic spondylodiscitis, Lumbar discitis

Introduction

Lumbar disc surgery was first described by Mixter and Barr in 1934 and it is one the most common type of spine surgery performed today [1]. The term post-operative spondylodiscitis was introduced in 1953 by Turnbull [2]. Although spondylodiscitis is uncommon, it is a significant risk following lumbar disc surgery. Although it might be either aseptic or septic, new study indicates that POD is primarily bacterial [3].



[1]Department of Spine Surgery, Zydus Hospitals and Healthcare Research Private Limited, Zydus Hospital Road, Thaltej, Ahmedabad, Gujarat, India 380054.

Address of correspondence :
Dr. Hitesh N. Modi,
Department of Spine Surgery, Zydus Hospitals and Healthcare Research Private Limited, Zydus Hospital Road, Thaltej, Ahmedabad, Gujarat, India 380054.
E-mail: modispine@gmail.com

POD is diagnosed as a result of several risk factors. It includes patient related, surgery related and hospital-surgeon related risk factors [4]. The most frequent microorganism that causes discitis is Staphylococcus aureus. Back pain is the most common symptoms associated with POD. It may be associated with leg pain or intermittent claudication and in rare cases, with fever. Additionally, it is usually confused with failing back syndrome. As a result, it is critical to distinguish POD from recurrent disc herniation, epidural hematoma and scarring [3, 4]. The diagnosis of POD depends on a combination of clinical, laboratory and radiological findings. The complications caused by POD may be long-lasting and could be irreversible. Therefore, early diagnosis and timely management of POD can shorten its course of disability and reduce the severity of sequelae[5, 6].

The optimal management of POD is controversial. Postoperative lumbar spondylodiscitis without any

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neurological involvement is usually treated non-operatively with long-term intravenous and/or oral antibiotics. The surgical debridement is usually reserved for the patients in whom medical management of the disease has failed or the disease load is more. Surgical management includes debridement with transpedicular fixation, transforaminal lumbar interbody fusion with cage, etc. In acute instances, certain authors effectively propose the use of a close irrigation device in addition to primary debridement [5, 6]. Early diagnosis and treatment including the ability to isolation of the causative organism, the beginning of antibiotic treatment targeted to that specific organism, and the length of treatment all affect the outcome of POD [6].

The purpose of this study is to assess available papers on post-discectomy lumbar spondylodiscitis. In this review article, we analyse the incidence, risk factors, causative organisms, diagnosis modalities (including clinical features, blood and radiological investigations), management strategies (conservative and surgical) and prevention for postoperative lumbar spondylodiscitis in the published literature. Our aim was to evaluate only post lumbar discectomy patients who might develop POD.

Material and Methods

We searched the literature regarding postoperative lumbar spondylodiscitis using the combinations of different terms: postoperative discitis, postoperative spondylodiscitis, postoperative disc space infection etc. using PubMed, MEDLINE and Google scholar. We have reviewed papers available only in English language; and have been published from the year 2000 onwards. Article titles and abstracts were evaluated to identify those related to spondylodiscitis following lumbar discectomy. Secondary evaluation of the articles which include full review was undertaken to further discriminate the primary findings. Spontaneous lumbar discitis, post-procedural spondylodiscitis and postoperative cervical-thoracic discitis are beyond the scope of this review; and therefore, they were excluded from the current study (Fig 1).

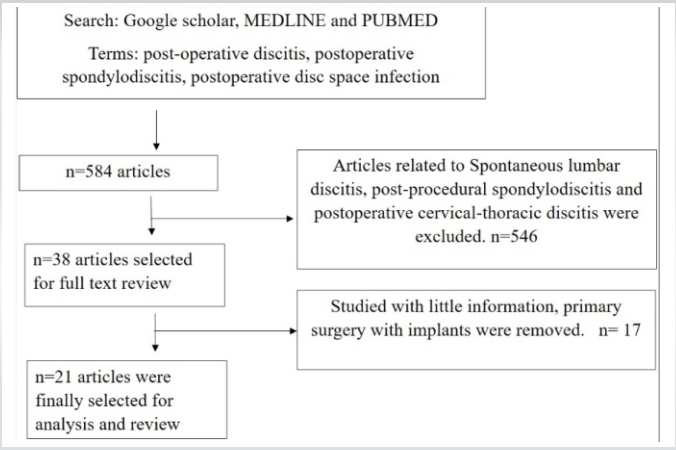

Figure 1: Literature search methodology and selection of articles.

Findings	Results
Incidence	0.94%
Age (mean)	45.18±4.17 years
Sex	61.93% males and 38.07% females
Risk factors	25.8% diabetes mellitus, and other risk factors were obesity, chronic smoking, malnourishment, varicose veins of the lower limbs, deep vein thrombosis, urinary colibacillosis, cholecystitis, perianal fistula, chronic hepatitis, hepatic steatosis, chronic alcoholism.
Causative Organism	19.8% staphylococcus aureus (including methicillin sensitive and resistant staph. aureus), 13.1% Echerichia Coli, 6.5% Pseudomonas aeruginosa, 5.57% Staphylococcus epidermidis. Other isolated organisms were Klebsiella, P. acnes, Staph. lugdunensis, Strept. sanguinis, Serratia marcescens, Acinetobacter, Bacteroides, Propionibacterium, and Staph. Saccharolyticus etc
Management	56% conservative and 44% surgical
Prognosis	40.1% excellent results, 56% good result and 3.9% fair and poor result.

Table 1: Descriptive analysis of study literature in our study table 1

Results

A total of 21 articles with their full texts were shortlisted and reviewed. These were further divided as per availability of data. All available patient data were analysed and of 21,525 patients were included in study who underwent with primary surgery for lumbar discectomy, 202 patients developed POD. This gives the incidence rate of 0.94% for POD in our study. The age range of cases were 38 to 56 years with a mean age of 45.18±4.17 years. It took an average of 2 to 8 weeks from the discectomy to the diagnosis being made. In our study, 61.93% patients were men, whereas 38.07% were females.

Regarding comorbidities, 25.8% of the patients suffered from associated diabetes mellitus, and other risk factors were obesity, chronic smoking, malnourishment, varicose veins of the lower limbs, deep vein thrombosis, urinary colibacillosis, cholecystitis, perianal fistula, chronic hepatitis, hepatic steatosis, chronic alcoholism. Culture and sensitivity report usually do not show any growth in 47% of cases. Out of all patients tested positive, 19.8% showed staphylococcus aureus

Authors	Year	No. of patients	Treatment
Santhanam R.[15]	2015	18	18 Conservative and 5 operative
Moon et al.[24]	2012	35	31 Conservative and 4 operative
Chang et al.[9]	2019	10	10 operative (single stage debridemnet withTLIF)
Salgotra et al.[28]	2018	11	11 operative(single stage debridemnet withTLIF)
Sheha et al.[26]	2011	9	9 operative(single stage debridemnet withTLIF)
Jain et al.[4]	2019	12	10 Conservative and 2 operative(debridement and posterior fixation)
Srinivas et al.[8]	2016	10	10 Conservative
Basu et al.[39]	2012	17	13 Conservative and 4 operative(3 patients - debridement and instrumented posterolateral fusion and one with percutaneous transpedicular fixation)
Singh et al.[17]	2018	31	25 Conservative and 6 operative (debridement and transpedicular fixation)
Hamdan et al.[23]	2012	35	6 Conservative and 29 operative(debridement alone)
Adam et al.[5]	2014	24	24 Conservative
Ahn Y.[16]	2012	12	4 Conservative and 8 operative (2 patients- surgical debridement alone,6 patients-surgical drainage with anterior lumbar interbody fusion with posterior instrumentation surgery.)
Kutlay et al.[10]	2008	22	22 Conservative with antibiotics and HBO2
Bavinzski et al.[12]	2003	17	17 operative(microsurgical debridement and close suction irrigation)

Table 2: Shows management in postdiscectomy discitis cases.

(including methicillin sensitive and resistant staph. aureus), 13.1% showed Escherichia Coli, 6.5% showed Pseudomonas aeruginosa, 5.57% showed Staphylococcus epidermidis. Other isolated organisms were Klebsiella, P. acnes, Staph. lugdunensis, Strept. sanguinis, Serratia marcescens, Acinetobacter, Bacteroides, Propionibacterium, and Staph. Saccharolyticus etc.

Almost all patients included in this study had severe back pain with muscle spasm, radicular pain, no improvement with rest, positive Lasegue's sign, refusal to do any movement and in some cases associated with fever. ESR and CRP were elevated in all cases with Elevated CRP and ESR values returned to normal range within 3–8 weeks of treatment onset. MRI was the investigation of choice in all studies.

In all studies, initially all were treated conservatively with IV antibiotics followed by oral antibiotics, strict bed rest, nutritional diet, analgesic, orthosis, and physiotherapy. The antibiotic regimen was chosen empirically to cover gram positive, gram negative and anaerobic organisms. But the patients, who were not improved clinically, haematologically and radiologically, were treated with surgical management. But in all studies, the surgical method for each surgery was primarily dependent on surgeons' preferences, by which surgeons chose the approach and type of surgery. 56% patients were managed conservatively. Other remaining patients were managed with surgical treatment including one stage debridement with posterior transpedicular fixation, transforaminal lumbar interbody debridement with fusion by titanium cage and anterior autogenous bone graft and posterior fusion. After surgical treatment, antibiotics treatment continued for 2-4 weeks.

Final outcome assessment at final follow-up showed excellent result in 40.1% of patients, good result in 56% and Fair and poor result in 3.9%.

Discussion

Incidence

Discitis is one of the dreadful complications of the surgeries of lumbar disc. It is highly resistant infection of intervertebral disc tissue and secondarily of endplates[3]. The incidence rate is 0.94% for POD in our study. The incidence of postoperative lumbar discitis in other studies are as showed in table 2.

Postoperative disc space infection, also known as spondylodiscitis is relatively uncommon condition with

estimated incidence ranges from 0.2%-3.6% in west and 4%-10% in India. POD, on the other hand, accounts for 20%-30% of all occurrences of pyogenic discitis [3]. According to Adam et al., 1% patient were diagnosed with POD between the years 2002 and 2011 among the 4698 patients who underwent lumbar discectomy [5]. Jain M et al. reported 8 % incidence of post-operative lumbar discitis. They revealed in their study of 124 cases of lumbar discectomy that 10 patients reported spondylodiscitis post-operatively during follow-up [4].

Risk factors

Lumbar discitis after discectomy results from many risk factors related to patients, surgery, hospital and surgery team related factors. These risk factors play a very important role in occurrence, type and management of post discectomy spondylodiscitis [6].

Risk factors associated with patients are diabetes, rheumatoid arthritis, obesity, renal failure, malignancy, malnutrition, long-term steroid intake, old age, alcohol addiction, smoking, immunosuppression. In obese patients, post-operative spondylodiscitis may be related to biophysical alteration in these patients and technical issue with surgery like extensive tissue dissection, prolong and wide retraction, use of electrocautery causing fat necrosis which may promote bacterial proliferation. In this, some risk factors are modifiable so most of the surgeons will attempt to minimize the risk of postoperative disc infection. Jain M et al. reported in their study that they identified at least 58% of patients having at least one confounding factor [18].

Surgery related risk factors include damage to lower and upper end plates following curettage, inadvertent introduction of germs, hematoma in intervertebral disc space, longer operative time and instability [19]. According to certain studies, infections of the respiratory or urinary tract might enhance the incidence of POD. Prolonged hospitalization, indwelling catheter for long period also increase the risk of discitis. Bacterial shedding into the surgical field can be caused by surgical equipment like a microscope or a head-light. Although, there has not been shown direct relation between increased contamination from these devices and increase in rate of POD [20, 21]. Singh DK et al. reported that there is limited evidence that minimally invasive surgery may decrease the risk of POD with reported 16.1% cases of discitis in their study following microdiscectomy [17].

Other study by Koutsoumbelis et al. reported four surgery related risk factors. These are longer duration of surgery, excessive blood loss during surgery, incidental durotomy, >10 people in the operation theatre [22]. Other articles have also reported the same. According to Hamdan TA et al., there is no relationship between the size of the disc herniation and the development of infection; however, extensive surgery because of the adhesion, was a cause of POD. They came to the conclusion that the development of discitis may have been influenced by the fact that 25.7% of the patients in their study had persistent urinary tract infections [23].

The most frequent risk factor in our study was diabetes mellitus. Other risk factors included obesity, long-term history of smoking, malnutrition, varicose veins, deep vein thrombosis, urinary tract infection, cholecystitis, perianal fistula, chronic hepatitis, and chronic alcoholism.

Causative organisms

POD is usually pyogenic. However, tuberculous and fungal spondylodiscitis have been reported but in this review article, we have discussed about post-operative pyogenic lumbar discitis. Causative micro-organism in postoperative lumbar discitis can be reported with microscopy, culture finding and any specific pathogens identified by either method. Isolation of causative organism can be done from percutaneous or open bone biopsy specimens, cultured blood, and/or specimens from another adjacent infectious foci [6, 18].

The most common microorganisms that cause post-operative spondylodiscitis are gram-positive cocci. Most common organisms isolated are Staphylococcus aureus in almost 50% of cases followed by other Staphylococcus species, gram negative organisms and anaerobic organisms. Less common organisms include streptococcus species, Mycobacterium tuberculosis, Escherichia coli and Pseudomonas aeruginosa, Klebsiella pneumoniae, Enterobacter cloacae, Bacteroides, and Proteus species [20]. According to Jain M et al., 4 patients (33.3%) of the 12 patients of post-operative discitis had positive blood cultures. Out of these four patients, three showed Staph. Aureus (2 methicillin-susceptible and one methicillin resistant) and one showed Pseudomonas aeruginosa [4]. Moon et al. reported regarding 12 patients who underwent percutaneous disc aspiration, the causative organisms were Staphylococcus aureus in 6 patients, Staphylococcus epidermidis in 3 patients, Enterobacter species in 1 patient, Pseudomonas aeruginosa in 1 patient, and Bacteroides in 1 patient [24].

Katonis et al. described 18 individuals who developed spondylodiscitis following discectomy. They isolated causative organism in three patients. One of the three patients had methicillin-resistant Staphylococcus aureus, while the other two had Serratia marcescens grow in tissue culture. Other studies have linked P. acne and diptheroids, to post-operative spondylodiscitis, which are commonly found in skin flora [25]. Sheha AF reported that cultures of the pus samples obtained during surgery showed no growth in two patients, Staphylococcus Aureus in 5 patients, Klebsiella in one patient and Escherichia Coli in one patient [26].

Staphylococcus is therefore thought to be the causative

organism for post-operative spondylodiscitis. It is also sometimes not possible to obtain any specimens. So many patients are treated on the basis of clinical and radiological findings alone.

Diagnosis

Clinical features [4, 9, 17, 23, 27, 28]

Clinical symptoms of the post-operative lumbar spondylodiscitis are very vague. Therefore, surgeons should have a high index of suspicion for POD and must watch carefully for any deviation from the usual postoperative course, such as an unanticipated switch from a painless to a painful state. The most common presenting symptom is pain. Frequent relationships exist between pain, fever, and other neurological disorders. Pain is frequently unremitting and poorly responding to medications and is not relieved after rest [9, 17].

Hamdan et al. reported 35 cases of post-operative spondylodiscitis. Patients' clinical characteristics were examined. Significant clinical results included severe back pain, muscular contraction, restricted movements, spasticity, sciatica, difficulty to bend, positive Lasegue's sign, and unwillingness to do any movement; they also discovered that shaking the patient's bed caused discomfort. But no any neurological deficient was recorded [23]. Ahsan K et al. reported 38 cases of POD. All patients claimed that their back pain was continuous and worsened at night. Pain was mild to severe and excruciating in nature associated with morning stiffness [27].

Salgotra et al. reported 11 patients with postoperative discitis. Clinical symptoms were pain in 11 patients (100%), motor deficit in 4 patients (36.3%), fever with chills in 3 patients (27.2%), local tenderness over spine in 11 patients (100%), 11 patients had paravertebral muscular spasms (100%), 11 patients had difficulties in walking (100%), and there was no superficial infection at incision site. Neurological involvement of lower libs were identified in 9 patients (81.8%) and no impairment of bladder and bowel function [28].

Most cases of postoperative discitis develops between 15 to 90 days after surgery. Santhanam R et al. showed average 2 weeks of interval between primary discectomy and development of discitis [15]. Jain M et al. showed 2-8 weeks of interval between discectomy and postoperative spondylodiscitis. Singh et al. showed same as above with time interval between of 2-3 weeks for development discitis [17].

Investigations [29-31]

For effective therapy and better prognosis, clinical, laboratory, and radiographic examinations must provide a quick and precise diagnosis of postoperative discitis [15]. The presence of persistently high erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), as well as MRI and clinical characteristics, aids in the diagnosis of POD. Elevated ESR and CRP are suggestive but not confirmatory of discitis diagnosis [32, 33]. Postoperatively increased CRP levels typically decline within 10 days, whereas ESR declines over the course of 3–6 weeks. As a result, CRP is a more accurate sign of bacterial illness. So, elevated CRP values any times beyond 2 weeks of surgery should be viewed with suspicion [33, 34]. According to Barrey et al., POD should be taken into account when ESR and CRP levels exceeding 45 mm/h and 25 mg/L, respectively. These values are supportive but not confirmatory for the diagnosis of discitis due to their non-specificity [35]. In their series of 348 patients, Kang et al. found that when CRP levels were checked on patients who underwent lumbar discectomy surgery on Days 1, 3, and 5 to diagnosis postoperative discitis, they found elevated CRP levels had sensitivity and specificity of 100% and 97% for infection, respectively, but the positive predictive value was only 31%. However, these are highly helpful indicators for tracking the effectiveness of treatment [36].

The initial imaging modality used for radiological assessment is x-ray, although the findings are insensitive at the early stage. Abnormal results appear in x-rays after weeks and/or months later. X-ray findings might be decrease in intervertebral disc space, destruction of end plate. However, it is not efficient for identifying changes in surrounding soft tissues. Compared with x-rays, computed tomography (CT) is more sensitive in diagnosing discitis [31, 33]. A CT scan can reveal early bone abnormalities in end plates. Those changes show an erosive and destructive end plates close to the infected disc material, as well as a reduction of disc space height. MRI is superior to both gallium 67 and technetium 99 bone scanning in diagnosing postprocedural discitis and will demonstrate disc changes sooner than CT [15, 30].

The investigation of choice for postoperative pyogenic discitis is MRI with high sensitivity and specificity. It is sensitive enough to observe early changes in early period of post-operative spondylodiscitis (3-5 days). MRI of post-operative spondylodiscitis will show a decrease signal on T1 weighted images and increase signal on T2 weighted images in nucleus pulposus and in affected vertebra bodies, bulging of the paraspinal soft tissue, stenosis of disc space. MRI with gadolinium scan is more sensitive. In gadolinium base MRI, findings of discitis will be decreased bony signal intensity of the adjacent vertebral body on T1 weighted images. But it is usually not used to diagnose POD. In recent systemic review about MRI in discitis, the sensitivity, specificity and veracity were 93%, 97%, and 95% respectively. MRI can also show an abscess that requires surgical exploration. However, these changes in MRI should be monitored with caution, because they resemble as acute end-plate injury during surgery,

remnants of an extruded disc, and Modic Type I changes like non infective conditions [33]. The role of imagine in diagnosis of discitis is unclear. Nuclear scanning is rarely used for the diagnosis of postoperative discitis. Bone scans are often nonspecific and may show generalized uptake around the infective area. The two most often utilized isotopes are gallium-67 and technetium-99m, however gallium-67 provides for more accurate and sensitive diagnosis. Gallium-67 also normalize during the recovery phase and may be used to follow treatment response [29].

Percutaneous biopsy and culture were also recommended by others as a means of obtaining a conclusive diagnosis, however the percentage of false-negative findings was significant. It mandates and is advocated to take biopsy of infective discitis before starting the antibiotics. Some authors also reported transforaminal aspiration of disc or pedicular biopsy for culture report. Adapon first described computed tomography (CT) guided percutaneous biopsy. After that it has been widely used as cost-effective procedure. The literature has a number of studies on CT-guided aspiration of the infected disc material and culture sensitivity, but the limited yield of such aspiration lowers determination for this approach. Sometimes the aspiration of discitis by thin bore needle might not yield any infected material. There are also problems with mixed infections especially with anaerobes and it is difficult to diagnose all the organisms present at the infected site. According to reported in studies, the accuracy of spinal biopsy ranges from 36% to 91% to detect infective organism [35]. According to Enoch et al., CT-guided biopsy yields unsatisfactory results, but percutaneous endoscopic discectomy and drainage (PEDD) yields considerably greater outcomes in identifying the underlying organism. The proportion of positive results from PEDD has been reported to be as 86% to 90%. Yang et al. showed that culturing obtained positive findings in 90% of patients in a PEDD group but CT-guided biopsy group showed positive finding for only 47% of patients [37, 38].

Basu et al. reported that ESR and CRP values were elevated in all patients with postoperative discitis and total counts were elevated in 41% of patients. X-rays were obtained earlier showed little evidence of discitis, however, after 6-8 weeks showed decreased in disc height and endplate erosions. CT in all cases showed end plate erosions which was present as early as 3-6 weeks. In 17.65% cases, CT scan showed small abscess formation. The characteristic MRI findings of discitis in the acute stages, found in all the patients with adjoining vertebral body edema [39].

Management

Unsatisfactory research has been done on the management aspect of postoperative spondylodiscitis, and most of it comprises of small sample size studies or case reports. According to Luzzati et al., establishing a bacteriological diagnosis is the initial step in the treatment of postoperative spondylodiscitis [40].

Conservative management

Management of postoperative discitis is still a challenge and has also been a matter of controversy. As there is no universally accepted treatment protocol for management of discitis, the management protocol varies among the surgeons. The current decision for treatment of postoperative discitis is combination of analgesics, long term use of antibiotics and spinal immobilization such as bed rest and spinal bracing initially. Initially if causative organism is unknown then the antibiotics should be administered empirically. Percutaneous disc biopsy of affected level under CT monitoring was advised to determine the efficacy and safety of antibiotics before administration of antibiotics. Antibiotics are adjusted as per sensitivity of isolated causative organism from the biopsy and/or blood culture report [41].

Antibiotics treatment is strengthened if the patient has a constitutional reaction-fever, leucocytosis, and so on, but this is uncommon. The antibiotics in patients who present late is more open to question. Dall et al. in their study concluded that immobilization alone is probably all that is requires. Once sclerosis is established in the healing phase, it seems unlikely that antibiotics reach the disc space in a significant concentration, but there is no information available to support this somewhat speculative contention [42].

The recent literature advocated that systemic antibiotics should be administered by IV infusion for minimum period of 4-6 weeks followed by oral administration for further 2-3 months. Failure rates are greater when IV antibiotics are administered for shorter periods of time than four weeks. The exact length of antibiotic treatment is depending on clinical features, haematological investigations and radiographic reports [43, 44]. Improvement of clinical symptoms and normalization of CRP are prerequisites for stopping antibiotic therapy. It has been proposed that a weekly 50% decrease in CRP represents treatment response; a lack of improvement in symptoms as well as a persistently elevated CRP above 30 mg/l are predictors of treatment failure [45].

Kutlay et al. published a study of 22 patients who received antibiotics and hyperbaric oxygen treatment. The results indicated that all 22 patients were successfully treated without recurrence [10]. Basu et al reported 13 cases of postoperative spondylodiscitis. Initially, all cases were treated with antibiotics and rest alone. 13 patients responded very well and other 4 patients needed surgical interventions [39]. However, with the increasing prevalence of resistant organisms like MRSA and vancomycin resistant organisms (VRE), standard

antibiotics regimens are becoming less effective. But some new classes of antibiotics are effective against MRSA and VRE. Streptogramin class (Quinupristin/dalfopristin) and linezolid are the example of this new antibiotics and these are effective (80%) for treatment of VRE and other gram positive infections [21].

Hyperbaric oxygen therapy (HBO_2) has been used in the management of variety of infection and postoperative infection in bone and soft tissue as a supplement to medical treatment. Adequate delivery of oxygen to wound tissue is vital for the healing process and for resistance infection. It has been shown that HBO_2 therapy increases the oxygen tension in infected tissues, including bone. Improved tissue oxygen tensions in ischemic tissues stimulates bactericidal activity [7, 43]. Kutlay M et al. reported 22 patients with postoperative discitis. All patients were treated with vancomycin for 4 weeks, analgesics, and bed rest. Additionally, patients received HBO_2 (hyperbaric oxygen 100% O_2) twice daily for 4 weeks. Patients were improved with satisfactory results. So they concluded that duration of antibiotic therapy reduced and it might be attributable to beneficial effects of HBO_2 therapy [46].

Surgical management

The indication of surgical management is fail conservative management, severe pain, and neurological involvement. All different kind of surgical procedures that have been reported to be successful, but the best strategy for treating postoperative spondylodiscitis is still up for debate [10, 31]. According to Adam et al., in some situations, the outcomes of conservative management were unsatisfactory due to the poor vascularity of the discs and slow absorption of drugs. Therefore, more surgeons are advocating surgery in addition to antibiotics for postoperative spondylodiscitis [5].

Usually, POD with paravertebral fluid accumulation dose not respond to conservative antibiotic therapy alone. So, in these cases, surgical debridement with removal of necrotic tissue is usually the first line of treatment. The use of interbody fusion and instrumentation is still controversial. The decision of whether to keep or remove posterior implants further complicates the treatment strategy. Koutsoumbelis et al. concluded that after meticulous debridement and copious irrigation, spinal implants can be maintained to avoid creating instability and loss of deformity correction. Also, loose instrumentation should be removed and replace if needed [22]. Some surgeons recommended a phased procedure with an antibiotic treatment time in between the debridement and instrumentation [47].

Bavinzski et al. described a case study of 17 patients with postoperative discitis who were treated with early microscopic excision of necrotic tissue, irrigation of the disc space, and the use of a closed suction-irrigation device, specific antibiotic therapy, and early mobilization in light cast corset. They achieved excellent or good long-term result in 82% cases and 18% had poor results [12]. Li et al. published the study of 34 patients with postoperative spondylodiscitis who were treated with percutaneous discectomy and drainage. They found that elevated CRP and ESR values returns to normal range within 3-8 weeks [48].

Fountain was the first to publish a report on a surgical technique for treating spondylodiscitis and vertebral osteomyelitis. In that, anterior debridement with placement of allograft or autograft had been used, combined with placement of posterior implants. That strategy was based on the principle that instrumentation placed posteriorly involves a second operating field that is not (at least directly) contaminated [49]. Liljenqvist et al. reported 20 patients in their article with lumbar spondylodiscitis who all underwent single-staged operations consisting of anterior debridement and reconstruction. Reconstruction of the anterior column has receive great interest, because it shares 80% of the lumbar spine load [50]. Basu et al. reported that anterior debridement and fusion was technically quite difficult and the disc space approach from the back could be easier. They assumed that following major debridement, instrumentation would not raise the risk of re-infection. In fact, greater benefit can be achieved through spinal stabilization, which can even promote

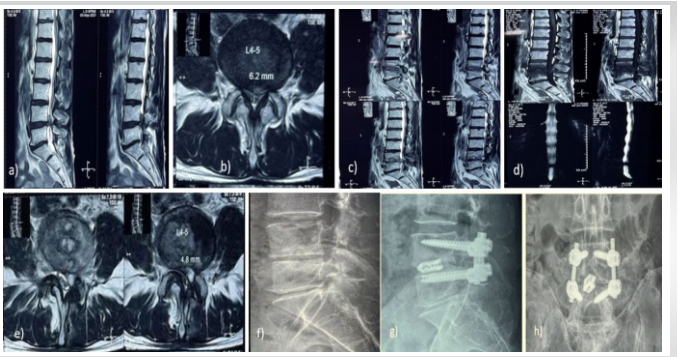

Figure 2: a-b) Preoperative MRI suggestive of disc herniation at L4-5. c-e) Postoperative MRI Sagittarius and axial view suggested spondylodicitis with epidural pus collection at L4-5. f) Postoperative x-ray of lumbar spine lateral view suggested reduction in disc space with irregular end-plates with sclerotic margins suggested infection and g-h) Shows postoperative x-ray of lumbar spine AP and lateral view of revision surgery shows TLIF at L4-5.

Authors	Year	Incidence
Khan et al.[7]	2019	4.40%
Srinivas et al.[8]	2016	5.20%
Chang et al.[9]	2019	1.00%
Kutlay et al.[10]	2008	2.70%
Kaliaperumal et al.[11]	2013	0.01%
Bavinzski et al.[12]	2003	0.95%
Diren et al.[13]	2019	0.95%
Kucuk et al.[14]	2017	1.10%
Santhanam R.[15]	2015	11.84%
Ahn Y[16]	2012	0.12%
Adam et al.[5]	2014	5.21%
Singh et al.[17]	2018	3.63%
Jain et al.[4]	2019	8.00%

Table 3: Incidence rate of post-discectomy discitis in literature.

accelerated healing [39].

Additionally, surgical management of postoperative discitis often includes PLIF. According to Zhang et al., continuous closed irrigation and drainage after single-staged instrumentation and fusion surgery may be a good alternative for treating postoperative spondylodiscitis [31]. Przybylski et al. came to the conclusion that PLIF of the affected vertebral bodies enabled early mobility, which decrease complications and improve prognosis [51].

The use of TLIF technique in the management of postoperative spondylodiscitis has not yet been described in many literatures. Sheha reported a study of 9 patients, developed postoperative lumbar spondylodiscits. All patients were initially treated conservatively. Despite adequate and prolonged conservative treatment, the nine patients continued to suffer from significant low back pain. So all those patients were treated by single stage debridement and TLIF and posterior instrumentation and achieved good results in all patients [26]. Salgotra B. et al. published study of 11 patients of postoperative lumbar spondylodiscitis with all cases underwent surgical management. They concluded that TLIF is excellent surgery for postoperative discitis with significant pain relief and early mobilization [28] (Fig. 2).

Some studies of POD along with their management are shown in table 3.

Prevention

The prevention of postoperative discitis includes all measures including attention to surgical technique, adequate facilities and compliance with operating theatre protocols (surgical scrub, the use of minimally invasive procedures where appropriate and antimicrobial prophylaxis). Pre and intra operative administration of antibiotics is the only way to prevent infection. Some authors recommend a first- or second-generation cephalosporin, or a glycopeptide plus gentamicin for patients who were allergic to cephalosporins or who were colonised with methicillin-resistant Staphylococcus aureus. They also suggested it in circumstances of lengthy surgeries. In operations with long incision and exposure they recommended the use of frequent (e.g., every 15 minutes) saline irrigation with or without betadine to reduce the wound contamination [52].

Intervertebral disc is avascular so use of preoperative antibiotics is controversial. But Lang et al. reported that antibiotics do reach disc space and inhibitory concentration of ceftriaxone reached the disc space when 2 gm of ceftriaxone was used. The chances of POD is greater when antibiotics are not used as a preventive measure [53]. According to Tai et al., 5 mg/kg of gentamicin must be administered to lower the risk of discitis [54]. Jain et al. utilized a single preoperative dosage of 500 mg gentamicin and 2 gm ceftriaxone and reported 15.6% incidences of postoperative discitis [4].

Conclusion

One of the most unpleasant complications following lumbar discectomy is postoperative spondylodiscitis. The most important factor to prevent postoperative lumbar spondylodiscitis is to minimize the possible risk factors and administration of appropriate pre and post-operative antibiotics. Diagnosis of discitis is made by presenting symptoms, blood investigations and radiological investigations. The first line of management after the diagnosis of postoperative discitis to start appropriate intravenous antibiotics followed by oral antibiotics for specific time period. Regular monitoring of haematological and radiological investigations is useful to evaluate the effectiveness of therapy. Various surgical modalities are available for persistent infective cases even after adequate conservative management and spinal immobilization.

References

1. Ramirez, L.F. and R. Thisted, Complications and demographic characteristics of patients undergoing lumbar discectomy in community hospitals. Neurosurgery, 1989. 25(2): p. 226-30; discussion 230-1.
2. Turnbull, F., Postoperative inflammatory disease of lumbar discs. J Neurosurg, 1953. 10(5): p. 469-73.
3. Jimenez-Mejias, M.E., et al., Postoperative spondylodiskitis: etiology, clinical findings, prognosis, and comparison with nonoperative pyogenic spondylodiskitis. Clin Infect Dis, 1999. 29(2): p. 339-45.
4. Jain, M., et al., Postoperative Lumbar Pyogenic Spondylodiscitis: An Institutional Review. J Neurosci Rural Pract, 2019. 10(3): p. 511-518.
5. Adam, D., T. Papacocea, I. Hornea and R. Croitoru, Postoperative spondylodiscitis. A review of 24 consecutive patients. Chirurgia (Bucur), 2014. 109(1): p. 90-4.
6. Eshra, M.A., Experience in the management of post-operative spinal infection. The Egyptian Journal of Neurology, Psychiatry and Neurosurgery, 2019. 55(1): p. 9.
7. Park, M.K., R.A. Myers and L. Marzella, Oxygen tensions and infections: modulation of microbial growth, activity of antimicrobial agents, and immunologic responses. Clin Infect Dis, 1992. 14(3): p. 720-40.
8. Srinivas, B., D. Sekhar, G. Penchalayya and K. Murthy, Post-operative discitis- a review of 10 patients in a tertiary care neurosurgical unit. J Dental Med Sci., 2016. 15(7): p. 1-4.
9. Chang, C.W., et al., Transforaminal Interbody Debridement and Fusion to Manage Postdiscectomy Discitis in Lumbar Spine. World Neurosurg, 2019. 121: p. e755-e760.
10. Kutlay, M., et al., Antibiotic and hyperbaric oxygen therapy in the management of post-operative discitis. Undersea Hyperb Med, 2008. 35(6): p. 427-40.
11. Kaliaperumal, C., D. Kuechler, G. Kaar, C. Marks and M. O'Sullivan, Does surgical technique affect the incidence of spondylodiscitis post-lumbar microdiscectomy? A retrospective analysis of 3063 patients. Spine (Phila Pa 1976), 2012. 38(4): p. 364-7.
12. Bavinzski, G., et al., Microsurgical management of postoperative disc space infection. Neurosurg Rev, 2003. 26(2): p. 102-7.
13. Diren, F., H. Can, M. Onal and A. Kircelli, The rate of spondylodiscitis in the patients with lumbar discectomy using single dose prophylactic antibiotics. J Academic Res in Med., 2019. 9(3).
14. Kucuk, A., et al., Surgical Strategies for Spondylodiscitis due to Lumbar Disc Surgery. Turk Neurosurg, 2017. 27(1): p. 95-98.
15. Santhanam, R. and K. Lakshmi, A Retrospective Analysis of the Management of Postoperative Discitis: A Single Institutional Experience. Asian Spine J, 2015. 9(4): p. 559-64.
16. Ahn, Y. and S.H. Lee, Postoperative spondylodiscitis following transforaminal percutaneous endoscopic lumbar discectomy: clinical characteristics and preventive strategies. Br J Neurosurg, 2012. 26(4): p. 482-6.
17. Singh, D.K., N. Singh, P.K. Das and D. Malviya, Management of Postoperative Discitis: A Review of 31 Patients. Asian J Neurosurg, 2018. 13(3): p. 703-706.
18. Shah, R., A. Garud, P. Vala and V. Sharma, Early onset postdiscectomy spinal tuberculosis: an uncommon complication. Asian J Orthopedic Research, 2019. March(7): p. 1-4.
19. Zink, P.M., A.M. Frank and A.E. Trappe, Prophylaxis of postoperative lumbar spondylodiscitis. Neurosurg Rev, 1989. 12(4): p. 297-303.
20. Weinstein, M.A., J.P. McCabe and F.P. Cammisa, Jr., Postoperative spinal wound infection: a review of 2,391 consecutive index procedures. J Spinal Disord, 2000. 13(5): p. 422-6.
21. Chaudhary, S.B., M.J. Vives, S.K. Basra and M.F. Reiter, Postoperative spinal wound infections and postprocedural diskitis. J Spinal Cord Med, 2007. 30(5): p. 441-51.
22. Koutsoumbelis, S., et al., Risk factors for postoperative infection following posterior lumbar instrumented arthrodesis. J Bone Joint Surg Am, 2011. 93(17): p. 1627-33.
23. Hamdan, T.A., Postoperative disc space infection after discectomy: a report on thirty-five patients. Int Orthop, 2012. 36(2): p. 445-50.
24. Moon, M.S., et al., Pyogenic discitis following discectomy. J Orthop Surg (Hong Kong), 2012. 20(1): p. 11-7.
25. Katonis, P., M. Tzermiadianos, P. Papagelopoulos and A. Hadjipavlou, Postoperative infections of the thoracic and lumbar spine: a review of 18 cases. Clin Orthop Relat Res, 2007. 454: p. 114-9.
26. Sheha, A., Surgical management of post-discectomy spondylodiscitis with transforaminal lumbar interbody fusion (TLIF) and posterior instrumentation. Life Sci J., 2011. 8(4): p. 140-42.
27. Ahsan, K., et al., Conservative versus operative management of postoperative lumbar discitis. J Craniovertebr Junction Spine, 2020. 11(3): p. 198-209.
28. Salgotra, B., S. Attry, D. Patel and K. Sansiya, Open transforaminal lumbar interbody fusion (TLIF) for post-discectomy spondylodiscitis: Our experiece. Indian J Neuroscience, 2018. 4(3): p. 144-9.
29. Chew, F.S. and M.J. Kline, Diagnostic yield of CT-guided percutaneous aspiration procedures in suspected spontaneous infectious diskitis. Radiology, 2001. 218(1): p. 211-4.
30. Rao, P.J., et al., Histological analysis of surgical samples and a proposed scoring system for infections in intervertebral discs. J Clin Neurosci, 2016. 30: p. 115-119.
31. Zhang, T., et al., One-stage posterior debridement and fusion combined with irrigation and drainage for the treatment of postoperative lumbar spondylodiscitis. Acta Orthop Traumatol Turc, 2018. 52(4): p. 277-282.
32. Harris, A.E., C. Hennicke, K. Byers and W.C. Welch, Postoperative discitis due to Propionibacterium acnes: a case report and review of the literature. Surg Neurol, 2005. 63(6): p. 538-41; discussion 541.
33. Van Goethem, J.W., et al., The value of MRI in the diagnosis of postoperative spondylodiscitis. Neuroradiology, 2000. 42(8): p. 580-5.
34. Meyer, B., K. Schaller, V. Rohde and W. Hassler, The C-reactive protein for detection of early infections after lumbar microdiscectomy. Acta Neurochir (Wien), 1995. 136(3-4): p. 145-50.
35. Barrey, C., et al., The follow-up of patients with postoperative infection of the spine. Eur J Orthop Surg Traumatol, 2013. 23 Suppl 1: p. S29-34.
36. Kang, B.U., S.H. Lee, Y. Ahn, W.C. Choi and Y.G. Choi, Surgical site infection in spinal surgery: detection and management based on serial C-reactive protein measurements. J Neurosurg Spine, 2010. 13(2): p. 158-64.
37. Enoch, D.A., et al., Value of CT-guided biopsy in the diagnosis of septic discitis. J Clin Pathol, 2008. 61(6): p. 750-3.
38. Yang, S.C., T.S. Fu, L.H. Chen, W.J. Chen and Y.K. Tu, Identifying pathogens of spondylodiscitis: percutaneous endoscopy or CT-guided biopsy. Clin Orthop Relat Res, 2008. 466(12): p. 3086-92.

39. Basu, S., J.D. Ghosh, F.H. Malik and A. Tikoo, Postoperative discitis following single-level lumbar discectomy: Our experience of 17 cases. Indian J Orthop, 2012. 46(4): p. 427-33.
40. Luzzati, R., et al., Diagnosis, management and outcome of clinically-suspected spinal infection. J Infect, 2009. 58(4): p. 259-65.
41. Wang, X., H. Tao, Y. Zhu, X. Lu and X. Hu, Management of Postoperative Spondylodiscitis with and without Internal Fixation. Turk Neurosurg, 2015. 25(4): p. 513-8.
42. Dall, B.E., D.E. Rowe, W.G. Odette and D.H. Batts, Postoperative discitis. Diagnosis and management. Clin Orthop Relat Res, 1987(224): p. 138-46.
43. Silber, J.S., D.G. Anderson, A.R. Vaccaro, P.A. Anderson and P. McCormick, Management of postprocedural discitis. Spine J, 2002. 2(4): p. 279-87.
44. Mann, S., M. Schutze, S. Sola and J. Piek, Nonspecific pyogenic spondylodiscitis: clinical manifestations, surgical treatment, and outcome in 24 patients. Neurosurg Focus, 2004. 17(6): p. E3.
45. McHenry, M.C., K.A. Easley and G.A. Locker, Vertebral osteomyelitis: long-term outcome for 253 patients from 7 Cleveland-area hospitals. Clin Infect Dis, 2002. 34(10): p. 1342-50.
46. Kutlay, M., A. Colak, S. Yildiz, N. Demircan and O.N. Akin, Stereotactic aspiration and antibiotic treatment combined with hyperbaric oxygen therapy in the management of bacterial brain abscesses. Neurosurgery, 2008. 62 Suppl 2: p. 540-6.
47. Matsui, H., N. Hirano and Y. Sakaguchi, Vertebral osteomyelitis: an analysis of 38 surgically treated cases. Eur Spine J, 1998. 7(1): p. 50-4.
48. Li, J., D. Yan, L. Duan, Z. Zhang and H. Zhu, Percutaneous discectomy and drainage for postoperative intervertebral discitis. Arch Orthop Trauma Surg, 2011. 131(2): p. 173-8.
49. Fountain, S.S., A single-stage combined surgical approach for vertebral resections. J Bone Joint Surg Am, 1979. 61(7): p. 1011-7.
50. Liljenqvist, U., et al., Titanium cages in the surgical treatment of severe vertebral osteomyelitis. Eur Spine J, 2003. 12(6): p. 606-12.
51. Przybylski, G.J. and A.D. Sharan, Single-stage autogenous bone grafting and internal fixation in the surgical management of pyogenic discitis and vertebral osteomyelitis. J Neurosurg, 2001. 94(1 Suppl): p. 1-7.
52. Gerometta, A., F. Bittan and J.C. Rodriguez Olaverri, Postoperative spondilodiscitis. Int Orthop, 2012. 36(2): p. 433-8.
53. Lang, R., Y. Folman, M. Ravid, T. Bental and R. Gepstein, Penetration of ceftriaxone into the intervertebral disc. J Bone Joint Surg Am, 1994. 76(5): p. 689-91.
54. Tai, C.C., et al., Antibiotic prophylaxis in surgery of the intervertebral disc. A comparison between gentamicin and cefuroxime. J Bone Joint Surg Br, 2002. 84(7): p. 1036-9.

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