Original Article

Early clinical effects of percutaneous endoscopic focal cleaning and drainage in the treatment of single level suppurative spondylitis

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Abstract

Background: Suppurative spondylitis is 4% of all osteomyelitis, including discitis, epidural abscess, and vertebral osteomyelitis. It is generally seen in young adults and elderly persons and specifically persons with weak immune systems. Suppurative Spondylitis patients, after experiencing a failure in the medicinal therapy, choose to undergo surgery. Few patients have deplorable conditions for surgery.

Objective: The objective of this study is to find out the effectiveness of the surgery procedure in the patient's body.

Methods: The most recently published research was collected, and the surgery information and their aftermaths of Percutaneous Endoscopic Discectomy (PED) was summarized. Data was taken from the previously published journal and analyzed and plotted using Excel software.

Results and Discussions: Recently, several studies have reported the positive outcomes of endoscopy treatments in the suppurative spondylitis, which allows for the drainage of the epidural abscess without opening the infected area, and this is applicable irrespective of the patient's condition. In article, the findings, and the different kinds of suppurative spondylitis were reviewed using the previously published data and the applicability of the percutaneous spondylitis in the patient's body and their side effects were examined (paralysis, weakness and epidural abscess formation).

Conclusion: After summarising all the effects, we can conclude that endoscopy must be an alternative to surgery for suppurative spondylitis. [*Ethiop. J. Health Dev.* 2021; 35(3): 244-248]

Keywords: Suppurative spondylitis, percutaneous endoscopy, osteomyelitis, conservative treatment.

Introduction

Suppurative spondylitis, is generally found in young adults, and is also reported in older people with weak immune systems [1]. Suppurative spondylitis is 4% of all osteomyelitis, including discitis, epidural abscess, and vertebral osteomyelitis. Early diagnosis of suppurative myelitis is difficult because pathogenesis is masked and unusual and has no specific symptoms [2]. If it is misdiagnosed in the early stages, it can cause death. So, diagnosis at the early stage and the necessary treatment plan for the disease is necessary. To date, its only therapy for suppurative spondylitis is open surgery and conservative treatment (Physical therapy and pain management). Treatment is very safe and effective, as this treatment is without involving the spinal cord. In some *Staphylococcus aureus* infected patients, backache and lumbago have been found due to late diagnosis. According to some researchers, due to blood supply disorder and hard bone, bactericidal drugs cannot reach the infected area properly [3]. So, the treatment becomes lengthy and drug-resistant mutation happens very quickly. If the disease continues, pseudo-articular formation occurs, and approximately 50% of lumber instability happens [4]. Later, if the disease persists for more than four weeks, then adjacent segmental destruction occurs, which results in the change in sequence of the spine. Surgical treatment is very effective for removing the lesion, spinal deformity cure, sepsis prevention and pain removal. However, open surgery has some disadvantages like postoperative complications, slow recovery, excessive bleeding, and comorbidity for elderly patients. Percutaneous transformational endoscopy application in the medical field has advanced. The advantages and disadvantages of endoscopy are yet to be explored.

Materials and methods

The most published research study was gathered, and the operation details and PED aftereffects were summarized. Data were extracted from a previously published article then evaluated and displayed in Excel.

Results

Diagnosis of spondylitis

According to Sapico and Montegomarie, Spondylitis symptoms have lasted for more than three months before diagnosis in 50% of cases [5]. The pain was observed in the >90% cases, and only fever was present in the >50% patients, but fever spikes were observed in rare cases. Pain is radiated from central locations, i.e. from the spine to leg, hip, scrotum, etc [6]. In 45-95% of cases, radicular symptoms (numbness, tingling, and muscle weakness) are present

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[7]. Along with the pain, spasm, paravertebral muscle tenderness and limited spine movement are significant symptoms of spondylodiscitis. About 10-15% of patients show neurologic symptoms like meningitis and nerve root compression [8]. Symptoms like pain radiation from the spine to radicular signs along with paralysis and weakness were found in cases with epidural abscess formation [9]. According to Eismont et al., due to anterior cord compression, motor and long-tract symptoms are more prominent than sensory involvement [10]. Infectious spondylitis has several non-specific symptoms like fever, back pain with sciatica or without sciatica, and malaise. Spondylitis should be identified by several disease symptoms, such as Erythrocyte sedimentation rate C-reactive protein values, MRI (Magnetic Resonance Imaging) findings, and histopathologic tests. The primary radiographic proof of infectious spondylitis is generally malformed intervertebral disc space with minor attrition of vertebral endplate. In severe case shortening of the vertebral body occurs due to osteolysis. In that case, a positive organism culture plate is required for diagnosis and treatment [11].

Percutaneous endoscopic discectomy (PED)

In the year 1980, a Percutaneous endoscopic discectomy (PED) was first applied for herniated disc treatment [12]. Nowadays, various endoscopic procedures have evolved for the herniation of the lumbar disc. The clinical result of endoscopic discectomy is equivalent to open surgery [13]. The minor intrusion and ease of the technique is directed to the application of PED techniques for the treatment of infectious spondylodiscitis. With the help of this technique, endoscopic observation and microbiological sample collection from the contaminated region are possible. Infected and necrotic tissue removal from the infected area, such as epidural space and disc, is possible under direct endoscopic observation.

Additionally, Hemovac drainage can regularly eliminate the abscess and pathogens in the infected part [14]. Efficient and antimicrobial treatment can cure patients. Negligible percutaneous therapy is used in the suppurative spondylitis in patients in cases of increased abscess formation in the vertebrae.

PED procedures

PED is done through posterolateral percutaneous methods under local anaesthesia with the help of the Yeung Endoscopic Spinal System. The patient is placed on the radiolucent frame, which is needed for intraoperative fluoroscopy. The target site entry point is determined under fluoroscopy. The patient is covered with a sterile barrier. After that, local anaesthesia is provided, and a spinal needle is directly placed into the targeted site, and an abscess is taken for microorganism culture [15]. A guidewire is placed into the disc space via a spinal needle, and after that the spinal needle is removed. Approximately a 1-centimetre stab wound incision is created and a cannulated sleeve is directed over the guidewire and placed serially in the disc place. To confirm the correct position of the dilator tip, a Fluoroscopic test is made in two orthogonal planes. Then the tissue dilator is removed, and a cutting tool is introduced to take a biopsy specimen. Later discectomy forceps are also introduced via the cannulated disc to take the excess tissue from the infected disc [16]. The tissue mainly consists of necrotic disc material and adjacent vertebral endplate fragments. The sample underwent fungal culture, histopathologic tests, anaerobic and aerobic cultures, polymerase chain reaction, etc. Normal saline is used after debridement, biopsy and intradiscal lesions is examined using endoscopy. After that, a negative pressure pump-connected drainage tube is introduced into the disc space. Tubes are left for three days or until the drainage reduces to 10ml/ day or stops. However, the patient can walk with the help of a Taylor's brace.

The clinical result of Endoscopic focal cleaning

According to a study among six patients who had spinal pain detected, five patients were completely free from pain after a week. The remaining one patient had persistent back pain. This patient died one month after surgery. There were no complications due to PED which were observed. PED also helps in the identification of the causative organisms among the patients. The figure 1 expresses the histopathological features of different types of Spondylitis. In predominat neutrophil infiltration shows more than 80% of Phyogenic spondylitis and predominat lymphocyte infiltration showed above 70% of Brucella spondylitis and tuberculous spondylitis. Figure 2 express the MRI findings of a different kind of Spondylitis. In MRI, Lumbar vertebrae shows above 70% of Brucella spondylitis and tuberculous spondylitis. Figure 3: express the comparison of local lesions of different types of spondylitis.

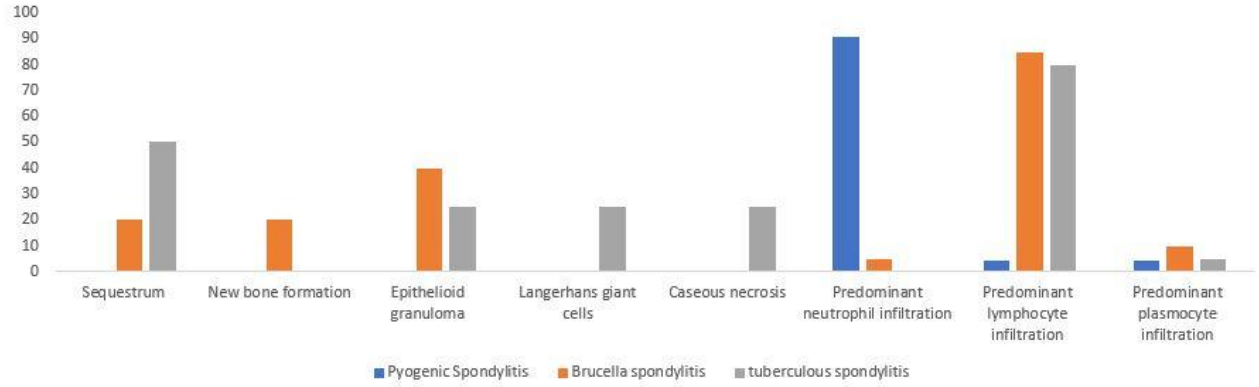

Figure 1: **Histopathological features of different types of Spondylitis [17]**

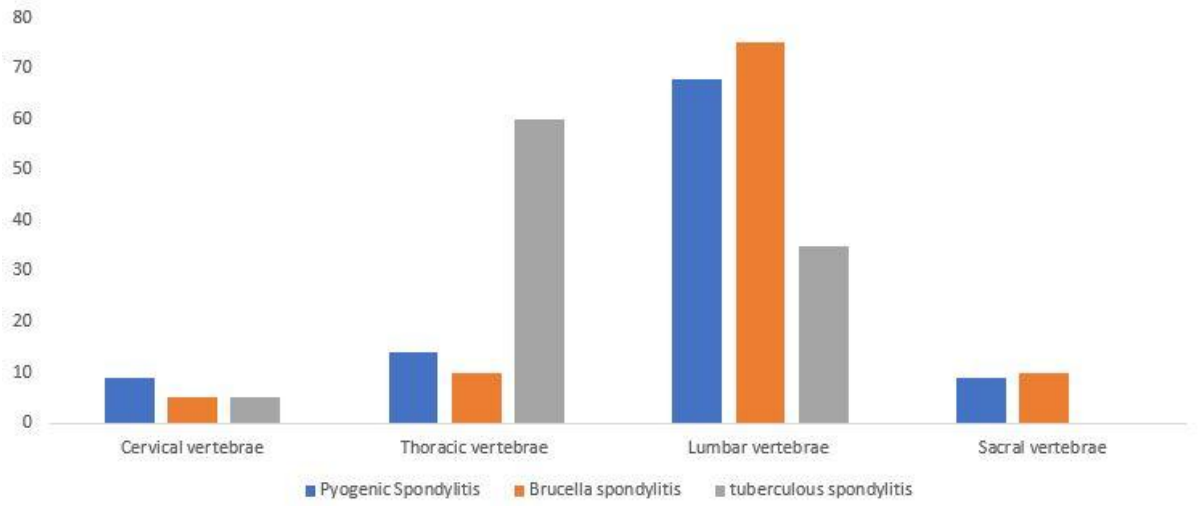

Figure 2: **MRI findings of a different kind of Spondylitis [17]**

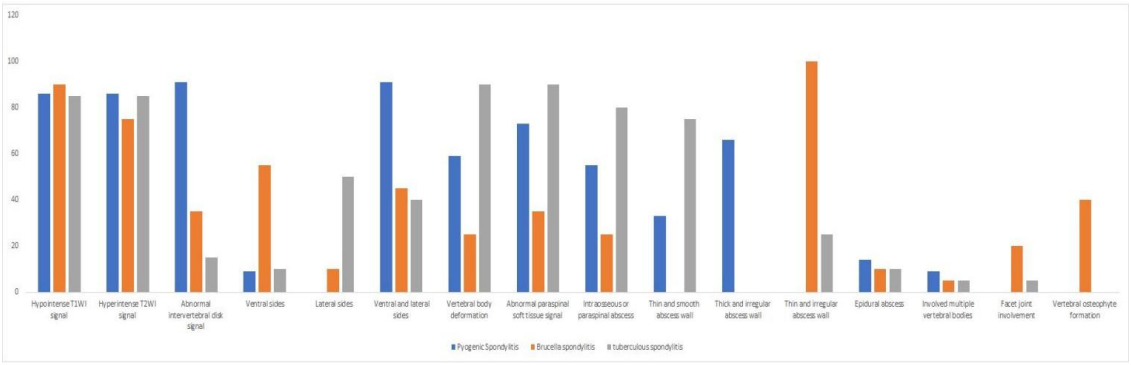

Figure 3: **comparison of local lesions of different types of spondylitis [17]**

Discussion

For Infectious spondylitis treatment, conservative endoscopy method is satisfactory for early detection patients. Surgery is needed for significant epidural cases, substantial neurological disorder and vast vertebral body destruction, spinal instability, or antibiotic treatment failure [18]. For spinal infection and bone destruction, better results were reported by autograft fusion and anterior debridement [19-21]. Spinal reconstruction surgery for spinal infection treatment shows a better result, while in the case of the immunocompromised patients, cardiac arrest case patients show significant complications [22]. There are some reports about postoperative mortality which were also found. Patients with significant comorbidity and high consequences were reported following major spinal surgery, thus these treatments are not promising for the treatment of spinal infection. PED shows some promising treatments for bone destruction or high abscess formation patients. PED is more precise in detecting the causative organism and minor operative change in the infected vertebrae [17-29]. Many techniques have been used for infectious spondylitis treatment. Among all the other techniques, Computed

tomography-guided catheter drainage is accepted as an effective and safe method in the early stage of spondylitis treatment [30]. According to Haaker et al., percutaneous lumbar discectomy is an advantageous method for lumbar discitis [28, 29].

For pyogenic spondylitis patients, percutaneous suction, aspiration, drainage, and local antibiotic administration are also very effective treatments. This treatment is also used for iliopsoas abscess-containing pyogenic spondylitis patients [30]. However, continuous irrigation limits postoperative ambulation. PED or Percutaneous endoscopic discectomy was first applied in 1980 for treating herniated discs. Nowadays, this technique has been applied to treating suppurative spondylitis or infectious spondylitis for its simplicity and minimum invasiveness. In the endoscopic treatment, direct observation and microbe collection from the infected area is possible. Under endoscopic monitoring, necrotic tissue eradication can be accomplished.

Furthermore, Hemovac drainage can draw the abscess and pathogens from the infected area after the operation. In a study, patients with spondylodiscitis with huge paraspinal abscess or epidural abscess were successfully treated with a Percutaneous endoscopic discectomy as the paraspinal and epidural abscess is initiated from the anterior spinal column and well connect with the infected area that will be successfully drained out by infected disc level treatment. The minor invasive method causes significantly less morbidity than the available treatment method and relieves the patients from reducing back pain effectively by reducing intradiscal pressure and maintaining stability. These patients early ambulate with brace protection after PED treatment. After PED, progressive indications have been reported from suppurative spondylitis and discitis patients. After a study by Fu et al., with the five different patients after PED treatment postoperative MRI study report, they recommend PED as an effective alternative for open surgery to treat infectious disease, especially with multiple comorbid patients. Open surgery treatment is not always needed in spondylitis therapy and the clinical progression can be re-assessed after the PED treatment.

Conclusion

PED is usually successful for suppurative spondylitis and epidural abscess. As a result, we believe that PED should be available to patients with suppurative spondylitis and those who are unable to receive anaesthesia owing to medical issues.

References:

1. Zheng Q, Ying X, Jin Y, Zhu B, Shen J, Wang Y, Zheng M, Liu F. Treatment of single-segment suppurative spondylitis with the transforaminal endoscopic focal cleaning and drainage. The journal of spinal cord medicine. 2021 Mar 4;44(2):267-75.
2. Rajkumar GC, Hemalatha M, Shashikala R, Kumar DV. Recurrent chronic suppurative osteomyelitis of the mandible. Indian Journal of Dental Research. 2010 Oct 1;21(4):606.
3. Bergdoll MS. Staphylococcus aureus. Journal of the Association of Official Analytical Chemists. 1991 Jul 1;74(4):706-10.
4. Castelein R. The Netherlands Orthopedic Society: Leeuwarden, January 16–17, 1997. Acta Orthopaedica Scandinavica. 1997 Jan 1;68(sup277):7-19.
5. Gupta A, Kowalski TJ, Osmon DR, Enzler M, Steckelberg JM, Huddleston PM, Nassr A, Mandrekar JM, Berbari EF. Long-term outcome of pyogenic vertebral osteomyelitis: a cohort study of 260 patients. open forum infectious diseases 2014 Dec 1 (Vol. 1, No. 3, p. ofu107). Oxford University Press.
6. Saavedra-Lozano J, Falup-Pecurariu O, Faust SN, Girschick H, Hartwig N, Kaplan S, Lorrot M, Mantadakis E, Peltola H, Rojo P, Zaoutis T. Bone and joint infections. The Pediatric infectious disease journal. 2017 Aug 1;36(8):788-99.
7. Asadian L, Haddadi K, Zare AH. Upper Lumbar Disk Herniation Presenting as Chronic Abdominal and Scrotal Pain: A Case Report. Neurosurgery Quarterly. 2016 May 1;26(2):177-9.
8. Meredith DS, Kepler CK, Huang RC, Brause BD, Boachie-Adjei O. Postoperative infections of the lumbar spine: presentation and management. International orthopaedics. 2012 Feb;36(2):439-44.
9. Zimmerli W. Vertebral osteomyelitis. New England Journal of Medicine. 2010 Mar 18;362(11):1022-9.
10. Lemaignen A, Ghout I, Dinh A, Gras G, Fantin B, Zarrouk V, Carlier R, Loret JE, Denes E, Greder A, Lescure FX. Characteristics of and risk factors for severe neurological deficit in patients with pyogenic vertebral osteomyelitis: A case–control study. Medicine. 2017 May;96(21).
11. Zheng Q, Ying X, Jin Y, Zhu B, Shen J, Wang Y, Zheng M, Liu F. Treatment of single-segment suppurative spondylitis with the transforaminal endoscopic focal cleaning and drainage. The Journal of Spinal Cord Medicine. 2019 Jun 11:1-9.
12. Sairyo K, Egawa H, Matsuura T, Takahashi M, Higashino K, Sakai T, Suzue N, Hamada D, Goto T, Takata Y, Nishisho T. State of the art: Transforaminal approach for percutaneous endoscopic lumbar discectomy under local anesthesia. The Journal of Medical Investigation. 2014;61(3.4):217-25.
13. Gibson JA, Cowie JG, Iprenburg M. Transforaminal endoscopic spinal surgery: the future 'gold standard'for discectomy?–A review. the surgeon. 2012 Oct 1;10(5):290-6.
14. Gu YT, Cui Z, Shao HW, Ye Y, Gu AQ. Percutaneous transforaminal endoscopic surgery (PTES) for symptomatic lumbar disc herniation: a surgical technique, outcome, and complications in 209 consecutive cases. Journal of orthopaedic surgery and research. 2017 Dec;12(1):1-3.
15. Fu TS, Yang SC, Tsai TT, Chen LH, Lai PL, Niu CC, Chen WJ. Percutaneous endoscopic debridement and drainage in immunocompromised patients with complicated

infectious spondylitis. Minimally Invasive Therapy & Allied Technologies. 2010 Feb 1;19(1):42-7.
16. Yang SC, Fu TS, Chen LH, Niu CC, Lai PL, Chen WJ. Percutaneous endoscopic discectomy and drainage for infectious spondylitis. International Orthopaedics. 2007 Jun 1;31(3):367-73.
17. Li T, Liu T, Jiang Z, Cui X, Sun J. Diagnosing pyogenic, brucella and tuberculous spondylitis using histopathology and MRI: A retrospective study. Experimental and therapeutic medicine. 2016 Oct 1;12(4):2069-77.
18. Hadjipavlou AG, Mader JT, Necessary JT, Muffoletto AJ. Hematogenous pyogenic spinal infections and their surgical management. Spine. 2000 Jul 1;25(13):1668-79.
19. Krödel A, Stürz H, Siebert CH. Indications for and results of operative treatment of spondylitis and spondylodiscitis. Archives of orthopaedic and trauma surgery. 1991 Feb 1;110(2):78-82.
20. Kwon JW, Hyun SJ, Han SH, Kim KJ, Jahng TA. Pyogenic vertebral osteomyelitis: clinical features, diagnosis, and treatment. Korean Journal of Spine. 2017 Jun;14(2):27.
21. Nagata K, Ohashi T, Ariyoshi M, Sonoda K, Imoto H, Inoue A. Percutaneous suction aspiration and drainage for pyogenic spondylitis. Spine. 1998 Jul 15;23(14):1600-6.
22. Fang D, Cheung KM, Dos Remedios ID, Lee YK, Leong JC. Pyogenic vertebral osteomyelitis: treatment by anterior spinal debridement and fusion. Clinical Spine Surgery. 1994 Apr 1;7(2):173-80.
23. Przybylski GJ, Sharan AD. Single-stage autogenous bone grafting and internal fixation in the surgical management of pyogenic discitis and vertebral osteomyelitis. Journal of Neurosurgery: Spine. 2001 Jan 1;94(1):1-7.
24. Akbar M, Lehner B, Doustdar S, Fürstenberg CH, Hemmer S, Bruckner T, Carstens C, Wiedenhöfer B. Pyogenic spondylodiscitis of the thoracic and lumbar spine: a new classification and guide for surgical decision-making. Der Orthopade. 2011 Jul 1;40(7):614-23.
25. Kim DY, Kim UJ, Yu Y, Kim SE, Kang SJ, Jun KI, Kang CK, Song KH, Choe PG, Kim ES, Kim HB. Microbial etiology of pyogenic vertebral osteomyelitis according to patient characteristics. InOpen forum infectious diseases 2020 Jun (Vol. 7, No. 6, p. ofaa176). US: Oxford University Press.
26. Fu TS, Chen LH, Chen WJ. Minimally invasive percutaneous endoscopic discectomy and drainage for infectious spondylodiscitis. Biomed J. 2013 Jul 1;36(4):168-74.
27. Krishnan A, Barot MP, Dave BR, Bang P, Devanand D, Patel D, Jain A. Percutaneous transforaminal endoscopic discectomy and drainage for spondylodiscitis: A technical note and review of literature. Journal of Orthopaedics and Allied Sciences. 2018 Jan 1;6(3):16.
28. Matsumoto T, Yamagami T, Morishita H, Iida S, Asai S, Masui K, Yamazoe S, Sato O, Nishimura T. CT-guided percutaneous drainage within intervertebral space for pyogenic spondylodiscitis with psoas abscess. Acta radiologica. 2012 Feb;53(1):76-80.
29. Ahn Y. Transforaminal percutaneous endoscopic lumbar discectomy: technical tips to prevent complications. Expert review of medical devices. 2012 Jul 1;9(4):361-6.
30. Fu TS, Chen LH, Chen WJ. Minimally invasive percutaneous endoscopic discectomy and drainage for infectious spondylodiscitis. Biomed J. 2013 Jul 1;36(4):168-74.