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Review Article

Spondylodiscitis after sacral colpopexy: diagnose early to treat earlier

Andrea Tinelli[1], Murat Yassa[2], Giuseppe Marzo[3], Daniela Romualdi[4], Matteo Frigerio[5], Alessio Melcarne[6], Giovanni Scambia[4], Giovanni Pecorella[7], Andrea Morciano[3]

[1]Department of Gynaecology and Obstetrics, "Veris Delli Ponti" Hospital, and CERICSAL (CEntro di RIcerca Clinico SALentino), "Veris delli Ponti Hospital", Scorrano, Lecce, Italy; [2]Department of Obstetrics and Gynecology, Sağlık Bilimleri Üniversitesi, Şişli Etfal Hastanesi, İstanbul, Turkey; [3]Panico Pelvic Floor Center, Department of Gynaecology and Obstetrics, Pia Fondazione "Card. G. Panico", Tricase, Italy; [4]Department of Gynaecology and Obstetrics, Fondazione Policlinico Universitario "A. Gemelli" - IRCCS, Università Cattolica del Sacro Cuore, Roma, Italy; [5]Department of Obstetrics and Gynecology, ASST Monza, San Gerardo Hospital, Monza, Italy; [6]Department of Radiology, Pia Fondazione "Card. G. Panico", Tricase, Italy; [7]Department of Obstetrics, Gynecology and Reproductive Medicine, Saarland University, Kirrbergerstraße 100, Gebäude 9, 66421 Homburg/Saar, Germany

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Abstract: Spondylodiscitis following sacral colpopexy for Pelvic Organ Prolapse (POP) represents a rare complication with severe consequences. Authors performed a literature search, from 2000 to 2022, to set a narrative review of literature. Spondylodiscitis is an uncommon but dangerous side effect of a routine surgical treatment that needs to be identified and treated right away to prevent worsening clinical consequences. Suboptimal dissection of the sacral promontory and/or site infection are associated with spondylodiscitis. When spondylodiscitis is suspected, advanced imaging methods should be used, and surgical excision shouldn't be put off after a failed course of treatment. Authors presented a case-video of a 68-year-old woman who reported severe lower back pain 7 weeks after surgery, in which sacral spondylodiscitis was diagnosed and laparoscopically treated. In this case, a laparoscopic tack and mesh removal from promontory was carried out following the patient's continued lower back pain and the antibiotic therapy's incomplete radiological remission of spondylodiscitis. The patient's radiological findings and symptoms completely resolved two weeks following the procedure.

Keywords: Spondylodiscitis, sacral colpopexy, pelvic organ prolapses, laparoscopy, complications

Introduction

Laparoscopic sacral colpopexy (LSC) or sacropexy is the gold standard procedure to correct apical pelvic organ prolapse (POP) [1]. The LSC is performed suspending vagina to sacral promontory, by using a surgical mesh. Although surgical techniques for LSC vary widely between surgeons [2, 3], the two-meshes technique better prevents against *de novo* posterior colpocele after vaginal axis verticalization [4].

The requirement for sacral promontory dissection and its associated risks, such as ureter and arterial injuries and spondylodiscitis, are the primary drawbacks of LSC compared to alternative methods [5-7]. Following sacral colpopexy, spondylodiscitis is an uncommon complication with serious repercussions for which there is a lack of clear information regarding care and prevention.

Herein, we performed a narrative review on such a surgical complication, with a case report and a video presenting the laparoscopic management of a sacral spondylodiscitis after a LSC procedure, performed by staple fixation of titanized polypropylene mesh on sacral promontory.

Materials and methods

Using a mix of keywords, the authors searched MEDLINE, Scopus, and PubMed for the years 1990-2022, including "spondylodiscitis", "sacral colpopexy", "pelvic organ prolapse", "laparoscopy", and "complications". When available, randomized controlled trials, or RCTs, were

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employed. Otherwise, the writers' assessment of the literature was employed to determine which works were most pertinent to the subject. This paper comprised peer-reviewed literature on sacral colpopexy and sacropexy. From the references of pertinent publications, more articles were found. We have presented the findings of our research in several paragraphs, using them to highlight the findings that have been documented in the scientific literature.

Results

Few occurrences of spondylodiscitis after sacral colpopexy or colpopexy surgeries have been reported in literature; this could suggest an underestimation of the problem or the possibility that surgeons do not want to report this dangerous complication to avoid criticism of the surgical technique, even if there is no proof of what we say [13, 14].

Materials potentially causing spondylodiscitis

Data regarding any potential elevated risk of osteomyelitis in patients submitted to LSC with sacrum tack fixation are scarce. Theoretical risk factors include the manipulation of the periosteum of the bone, ischemia resulting from devascularization during regular dissection, implantation of foreign bodies, or an undetected breach in the sterilization of instruments [14].

Of the 13 RCTs evaluated in a review [15], the graft was secured to the sacrum with a permanent titanium tacker in two studies [16, 17] and with either a permanent tacker or suture, at the surgeon's discretion in one [17].

In a case-control study of 2015, analyzing titanium tackers versus suture controls, there were no significant differences between the groups, in terms of anatomical correction or complication rates [18]. Nevertheless, there was a significant worse lumbar pain intensity and quality of life in the tacker group, as an investigation supported evaluating either permanent tackers or sutures for securing the mesh to the sacral promontory [19].

A recent randomized controlled trial showed that the success and long-term safety profile of absorbable sutures were comparable with permanent sutures in LSC, without losing its efficacy [20]. A cadaveric and imaging study, with a level of evidence of 2, showed that the most effective technique to avoid disc penetration is to place sutures on the anterior surface of S1 or below the sacral promontory for avoiding deep suture bites [21].

Since the anterior surfaces of L5 and S1 form a sharp descending angle of 60 degrees, the L5-S1 disc rather than the actual sacrum promontory is the most noticeable structure in the surgical presacral area [22]. The time between LSC procedure and the clinical manifestation of discitis varies from a few days to years, after mesh placement [12]. Most patients with spondylodiscitis began to exhibit symptoms less than five months following the surgery [22], and at least two cases out of every three ultimately require surgery [23]. Although theoretically possible, it is not clear whether titanium tacks increase the risk of osteomyelitis. More research is necessary to determine the best treatment methods and surgical materials and techniques that minimize the risk of infection when using synthetic materials for abdominal or LSC.

Instrumental diagnosis of spondylodiscitis

The clinician should order prompt magnetic resonance imaging (MRI), erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP), as clinically indicated. In order to prevent bone degradation, potential neurological consequences, and reoperation, it is advised to take advantage of an early computed tomography (CT)-guided needle aspiration.

Antibiotic treatment during spondylodiscitis

A recent analysis of the literature revealed that the types of antibiotics prescribed to medically treated patients varied and might range from 4 weeks to 6 months [22]. These antibiotics included vancomycin, advanced generation cephalosporins, and clindamycin [22-24]. Spondylodiscitis cases can occur either with positive or negative culture test [22, 25, 26]. The predominant causative microorganisms in nearly half of all instances of pyogenic spondylodiscitis are Staphylococcus and Streptococcus species, despite the fact that cultures obtained from the infection site have a roughly 60% consistency rate with peripherical cultures [27]. In patients with positive cultures, taken from the

infection site, Staphylococcus aureus was the most prevalent microorganism (21%), followed by Bacteroides spp. (18%), Enterococcus spp. (15%) and Pseudomonas aeruginosa (15%) [27].

Surgical treatment of a spondylodiscitis

A recent paper showed a laparoscopic complete excision of sacrocolpopexy mesh from a 65-year-old woman, who presented with delayed onset of persistent right-sided gluteal pain [28]. As the associated symptoms could be the consequence of graft rejection, which induced sterile inflammation rather than infection, a prompt removal of the mesh could lead to better clinical outcomes. Severe tissue destruction surrounding the surgical site could result from this rejection process, requiring extremely intricate and expensive therapies. Timely removal of tacks and mesh has the potential to reduce the host's reaction and alleviate incapacitating symptoms sooner. Without mesh erosion, an abscess, or the formation of a fistulous tract, infection may arise as a consequence of sacrocolpopexy with titanium sacral tacks.

Discussion

The term spondylodiscitis refers to infection of the vertebral body and the intervertebral disc space [7]. Since the disc space has no direct blood supply in adults, this space may only get infected by hematogenous spread, or direct inoculation of the microorganisms during invasive spinal surgical procedures. Spondylodiscitis is a rare but severe complication of sacropexy. Regardless of surgical experience, the surgical technique used for laparoscopic surgery varies greatly, and there is still a dearth of exact evidence regarding the effects of various approaches on surgical results [2, 10, 11]. The dissection of the sacral promontory was thought by pelvic surgeons to be the technically most challenging aspect of the treatment. This component involved the common and uncommon severe consequences of sacropexy, such as spondylodiscitis, ureteral, intestinal, and vascular injuries [2]. Several heterogeneities were observed in almost all steps of the LSC procedure, including the types of anchoring materials and the extent of vaginal and sacral dissection. Certain cases of spondylodiscitis that resulted from invasive spinal surgeries, like sacropexy, did not show purulent material during the second surgery, the infecting bacterium could not be cultured, and various antibiotic treatment regimens did not work [12].

According to the author's own experience, there has been a case of spondylodiscitis after LSC that did not fully respond to antibiotic treatment until improving after the removal of the mesh and tack. The role of infection and the possible underlying mechanism of spondylodiscitis were analyzed and compared to the available literature.

Authors' experience

A 68-year-old white patient, with two previous spontaneous births and no other surgical history, was submitted to a laparoscopic supracervical hysterectomy, bilateral salpingo-oophorectomy and LSC for severe POP. The Pelvic Organ Prolapse Quantification (POP-Q) scores were: Aa 3.0, Ba 5.0, C 8.0, Gh 6.0, Pb 1.0, TVL 10, Ap 3.0, BP 5.0, D 5.0 [8].

The LSC procedure was performed by traditional technique [9], with two separate titanized polypropylene meshes (TiMesh; PFM Medical, Cologne, Germany) along the anterior and posterior vaginal walls. The laparoscopic tacks (CapSure™ Permanent Fixation System; Bard, Franklin Lakes, USA) were used to fix the anterior mesh to the anterior longitudinal ligament over the sacral promontory. The procedure was performed without complications and the patient was discharged on second postoperative day. Nine weeks following surgery, the patient came in for a consultation. The patient described severe symptoms that began two weeks prior, including lower back discomfort and tenderness at the lumbosacral junction that radiates to the upper thighs and lower back, scoring a 9 out of 10 on Visual Analogue Scale (VAS). The lower back and spine's flexion, extension, and lateral rotation exacerbated these symptoms. The patient's white blood cell (WBC) count and CRP were, respectively, 5.29 per microliter (reference range 4.5-10.5) and 2.08 mg/dL (normal value <0.75).

The MRI scan revealed a L5-S1 spondylodiscitis with a signal alteration of the disc and the opposite vertebrae spongiosa, and a pathological signal enhancement after contrast medium administration (**Figure 1**). The patient was afebrile and her neurologic examination was normal. The blood and urine cultures were nega-

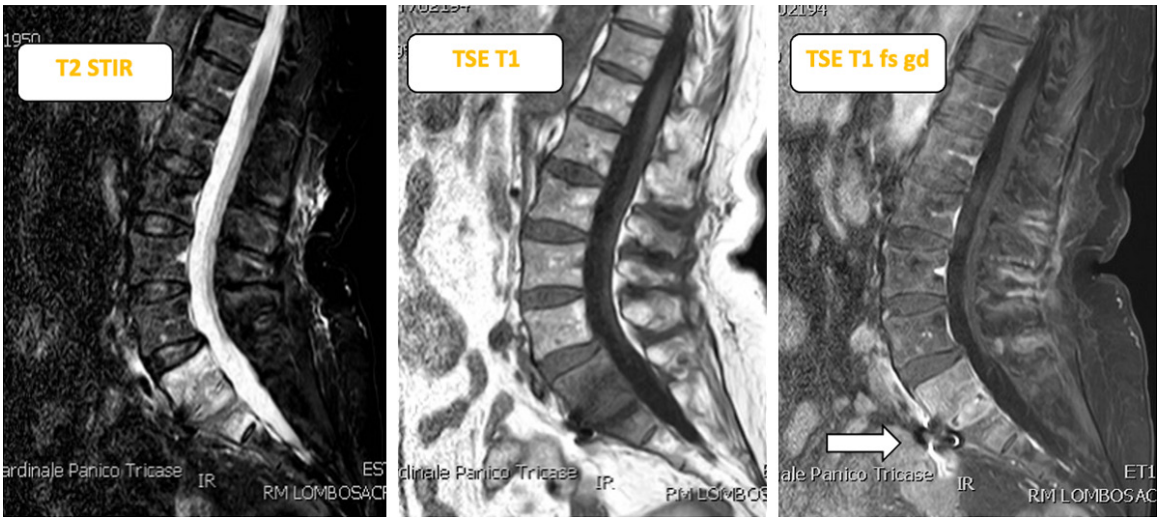

Figure 1. Magnetic resonance imaging (MRI) diagnosis of L5-S1 spondylodiscitis after laparoscopic sacral colpopexy (LSC).

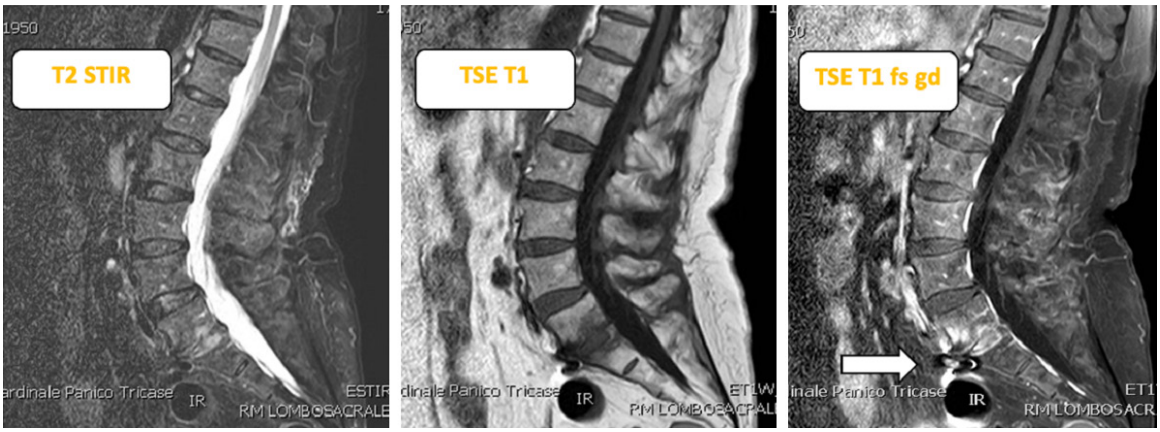

Figure 2. Magnetic resonance imaging (MRI) scans after eight weeks of medical treatment.

tive. A CT-guided needle aspiration of sacral bone produced a Gram stain, with rare polymorphonucleated WBC and no bacteria. Hemoculture did not exhibit any development of bacteria or fungi. Following a comprehensive evaluation, the patient received intravenous teicoplanin treatment for eight weeks. After two months of antibiotics, the CRP value was detected to be 0.6 and the MRI scan showed a significant reduction, but not a complete resolution, of the altered disc signal (**Figure 2**). According to the VAS (6/10), the patient's lower back pain symptoms have improved; however, the pain continues to worsen when the lower back and spine are extended, flexed, and rotated laterally. Two weeks after completing the patient's antibiotic treatment, we made the decision to perform a laparoscopic tack and mesh removal from the promontory due to the patient's continued reported lower back pain and the MRI abnormal findings of incomplete remission (Supplementary Video 1). The patient was submitted to a laparoscopic removal of the Capsure tack and about two cm of the mesh, close to the promontory. Patients reported full symptom resolution two weeks post-second surgery, and a positive MRI scan result (**Figure 3**) corroborated this. An 18F-FDG PET/TC total body scan further verified the full resolution of sacral spondylodiscitis. At 12-month urogynecological follow-up after laparoscopy, patient had perfect vaginal suspension, devoid of any anatomic malfunction.

Conclusions

Given the variety of presenting symptoms and differential diagnosis of osteomyelitis, we

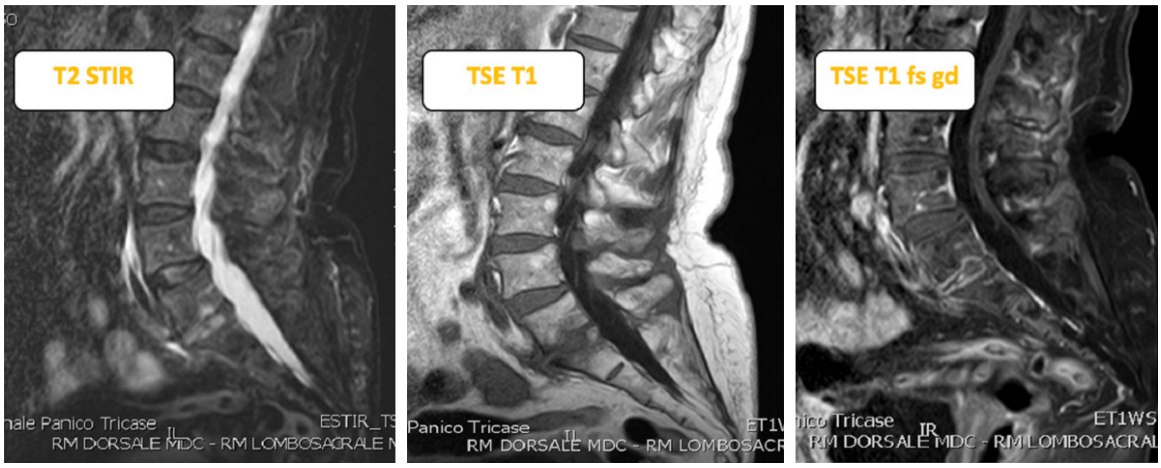

Figure 3. Magnetic resonance imaging (MRI) scans two weeks after the second laparoscopic surgery.

advise being wary of patients who present with exaggerated back pain after a sacral colpopexy using synthetic mesh and fixation materials, based on our experience as well as what is documented in the literature. Although LSC is still considered to be the gold standard for treating apical POP, it reports risks of severe early and late surgical complications, such as spondylodiscitis. Future investigations on a large sample of patients should focus on surgical techniques facilitating the optimal sacral promontory fixation, reducing complications, suggesting large RCTs comparing the late absorbable versus permanent sutures should be produced.

Disclosure of conflict of interest

None.

Abbreviations

LSC, Laparoscopic sacral colpopexy; POP, Pelvic Organ Prolapse; RCTs, Randomized controlled trials; MRI, Magnetic Resonance Imaging; ESR, Erythrocyte Sedimentation Rate; CRP, C-Reactive Protein; CT, Computed Tomography; POP-Q, Pelvic Organ Prolapse Quantification; VAS, Visual Analogue Scale; WBC, White Blood Cell.

Address correspondence to: Dr. Andrea Tinelli, Department of Obstetrics and Gynecology, "Veris Delli Ponti" Hospital, and CERICSAL (CEntro di RIcerca Clinico SALentino), "Veris delli Ponti Hospital", Via G. Delli Ponti, 73020 Scorrano, Lecce, Italy. E-mail: andreatinelli@gmail.com

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