directly on the anterior and anteromedial aspect of the femur below the lesser trochanter [3].

The literature often does not delineate between the two muscles, referring to the combined muscles as the iliopsoas or simply the psoas muscle. Making a distinction between these muscles can help determine the source of infection. With regards to musculoskeletal infections, the majority of psoas muscle abscesses reflect extension from an adjacent spondylodiskitis or septic facet [4–7]. In contrast, iliacus muscle abscesses are secondary to extension of an underlying hip infection through the iliopsoas bursa or infectious sacroiliitis.

The iliopsoas bursa is the largest bursa in the body and communicates with the hip joint in 14% of the population [8]. Communication of the joint capsule with the iliopsoas bursa is likely increased following hip arthroplasty [9]. With the majority of the bursa located deep in the iliacus muscle, hip joint infections typically involve the iliacus muscle alone or less often both the iliacus and psoas muscle [1,10]. When the psoas muscle is involved, there should be visible communication with a distended iliopsoas bursa. This is in contrast to the psoas abscess associated with spondylodiscitis, which does not involve the bursa.

Both lumbar spine osteodiscitis and septic hip arthritis can be associated with psoas abscess [11]. The spine as primary source of infection for secondary psoas abscess should always be included in the differential diagnosis [12]. Studies have reported that 10–36% of secondary psoas abscess is caused by disc infection [13,14]. The anatomical proximity and communication of the psoas muscle to the hip joint capsule creates a potential transit for bacterial spread from spine to the hip joint or vice versa [15]. Screening patients with a psoas abscess for both hip and spine infection can prevent this harmful infectious spread. However, it should also be considered that the infection may simultaneously result in multiple infection sites from the same original hematogenous source of psoas abscess or spinal infection.

A non-coincidental association exists between psoas abscess and hip infection, both in the virgin hip joint and in a prosthetic hip joint. There have been multiple reports regarding the progression of the extension of psoas abscesses into the virgin or prosthetic hip joints [16–19]. In one study, the percentage of prosthetic hip infections with associated psoas abscesses has been reported to be as high as 12% [19]. Hematogenous prosthetic infection and a medical history of neoplasm have been reported as risk factors of psoas abscess in patients with an infected hip replacement [19]. Psoas abscesses may also cause relapse of prosthetic hip infection.

It is recommended that practitioners screen patients with psoas abscesses for hip infection and spinal infection due to their anatomical communication, relationship in etiology and co-prevalence. Clinicians should be aware of the potential communication between the lumbar spine and hip joint via the psoas muscle and iliopsoas bursa. Successful treatment outcomes of psoas abscess are not only related to its early diagnosis, but also to the prompt detection of its spread to adjacent organs with potentially devastating outcomes, including the neural elements of spine and a prosthetic hip joint.

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1.5. PREVENTION: WOUND CARE

Author: Carles Pigrau

QUESTION 1: Is negative pressure wound therapy (NPWT) safe on spinal wounds in patients with a cerebrospinal fluid (CSF) leak?

RECOMMENDATION: NPWT may be harmful in patients with a CSF leak, leading to severe neurological sequelae.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 93%, Disagree: 7%, Abstain: 0% (Super Majority, Strong Consensus)

RATIONALE

Intracranial hypotension may develop after dural puncture or spinal surgery by accidental intraoperative opening of the dura. As a complication to this, several cases of accidental drainage after spinal surgery and application of negative pressure suction devices (NPSDs) have been reported [1–4]. Secondarily, intracranial hypotension may develop leading to tonsillar herniation, subdural hemorrhage, severe neurological sequel and even death.

Recently, Sporns et al. reviewed the literature published in reference to patients diagnosed with postsurgical or post-traumatic intracranial hypotension [1,4]. In 24 relevant reports that included 27 cases, in 15 cases a NPSD (including NPWT or pleural drainage after thoracic surgery or traumatism) was applied, ten had no negative pressure devices and two could not be determined for application of a suction drain. All patients with NPSD had severe neurological symptoms, while only mild symptoms were observed in cases without such devices. They concluded that the increasing use of NPSDs causes the reported condition and that acute intracranial hypotension should be considered as an explanation of postoperative neurological symptoms or coma after cranial or spinal surgery. A precise radiological examination (preferably with magnetic resonance imaging) can help to rule out intracranial hypotension and dural laceration.

In conclusion, in patients with spinal wounds, NPSDs (including pleural drainages) may be harmful and lead to more severe neurological sequel than those cases with liquoral hypotension secondary to dural laceration without negative pressure devices.

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QUESTION 2: What are the risks and benefits for the use of vacuum-assisted closure (VAC) devices/PICO dressings following spine surgery?

RECOMMENDATION: The use of incisional VAC therapy (such as PICO dressings) is limited, but available literature supports its use in the prevention of dehiscence and surgical site infection (SSI) in posterior thoracolumbar deformity surgery.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 86%, Disagree: 14%, Abstain: 0% (Super Majority, Strong Consensus)

RATIONALE

Multiple case series and case reports have been published supporting the use of VAC therapy for staged treatment of deep/subfascial SSI in spine surgery, with the common use being at index or second debridement, followed by multiple VAC changes until the wound is suitable for closure [1–4]. The specific VAC techniques (such as fascia open or closed, number of suction devices, suction settings, etc.) is poorly described in available studies. Ploumis reported on 73 patients undergoing VAC therapy for deep SSI, noting an average of 1.4 procedures following VAC placement (including closure) and closure of wound at an average of 7 days. They noted that methicillin-resistant *Staphylococcus aureus* (MRSA) and polymicrobial wound infections were more likely to require subsequent debridement after index VAC placement prior to definitive closure [2]. Similarly, Mehbod described 20 similar patients with deep SSI following spine surgery treated with VAC therapy, with an average of 2.2 procedures (including closure) following index VAC placement and resolution of infection in all patients and closed wounds by 6 months [3]. Canavese described 33 pediatric patients treated with VAC therapy for deep SSI after thoracolumbar spine surgery, with only 1 case ultimately requiring partial removal of implants [5].

Complications for VAC therapy have also been widely described, including need for reoperation and/or revision of hardware, bleeding, flap closure or skin grafting, retention of foam sponge fragments and cerebrospinal fluid (CSF) leaks resulting in neurologic complications (coma, brain herniation and intracranial hemorrhage) [1,2, 6–8]. The use of VAC therapy in the setting of CSF leak should be avoided due to risks of tonsillar herniation [7]. While VAC therapy over dura has been described in cranial surgery, no publication specifically described the application of sponges over dura in spine surgery. Multiple cranial publications describe the technique for dural application as the use of the "white" sponge (polyvinyl foam), as it is hydrophilic and less adherent, with lower suction pressures (~ 50 mmHg) [9,10].

The only available paper on the application of incision VAC therapy (such as PICO dressings) for spine surgery was published by Adogwa et al., who reviewed 160 posterior thoracolumbar deformity surgeries, of which 46 used incisional negative pressure wound therapy for 3 days. The authors reported lower rates of wound dehiscence (6.38% vs. 12.28%) and lower SSI rates (10.63% vs. 14.91%) for the incisional negative pressure wound therapy group, both reaching statistical significance ($p < 0.05$) [11].

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