

- [11] Bettini N, Girardo M, Dema E, Cervellati S. Evaluation of conservative treatment of non specific spondylodiscitis. *Eur Spine J.* 2009;18. doi:10.1007/s00586-009-0979-8.
- [12] Valancius K, Hansen ES, Hoy K, Helmig P, Niedermann B, Büniger C. Failure modes in conservative and surgical management of infectious spondylodiscitis. *Eur Spine J.* 2013;22:1837–1844. doi:10.1007/s00586-012-2614-3.

● ● ● ● ●

**Author:** Gregory Schroeder

## QUESTION 4: How do early and late infectious complications differ following spine surgery?

**RECOMMENDATION:** Early infections, defined as occurring within 30 days of surgery, often present with local signs of infection such as increased surgical site pain, erythema, warmth and wound drainage. Conversely, late infections (> 90 days after surgery) commonly present with an insidious onset of chronic pain and implant failure/ pseudarthrosis if following a fusion.

**LEVEL OF EVIDENCE:** Moderate

**DELEGATE VOTE:** Agree: 87%, Disagree: 0%, Abstain: 13% (Super Majority, Strong Consensus)

### RATIONALE

Postoperative spine infection occurs at a rate of 0.7–16% depending on the procedure; the lumbar spine is the site of 51% of infections [1].

A postoperative infection is classified as early when it occurs within 30 days of the initial surgery. Early infections typically present with increasing back pain (83–100%) as the primary symptom [2,3]. Fever, weight loss, erythema, swelling, warmth, tenderness and elevated white blood cell (WBC) count may also be present, with fever having an incidence of 16–65% [2–4]. One of the most reliable and specific signs of early infection is increased wound drainage (67%) as it can occur in both deep and superficial infections [4].

A postoperative infection occurring three to nine months following surgery can be classified as a late infection. As opposed to early infections, late infections typically present with delayed symptoms such as lack of adequate fusion, chronic pain or implant failure months after surgery [5]. Local symptoms may also occur, including increased pain and tenderness at the incision site. Wound drainage may occur but is less common than in early infections [5].

Complications of postoperative spine infection include impairment of function, significant morbidity and increased health care costs approximating up to \$200,000 per patient [1,3]. Increase in hospital stay and increased rates of repeat surgery have also been observed.

Gram-positive bacteria, specifically *Staphylococcus aureus*, are responsible for approximately 45% of spine infections [6]. Other

gram-positives such as *Staphylococcus epidermis* and *Enterococcus* as well as gram-negatives *Pseudomonas aeruginosa* and *Escheria coli* have been observed at lower incidences [1,2,6]. There is no clear association between type of surgical procedure and bacteria strain. However, gram-negatives tend to present more commonly in sacral and lumbar regions [6]. Fungal infections may occur in immunocompromised patients. *C. acnes* has recently been identified as another potential causative organism [2]. No significant difference has been observed in the type of organism present in early and late infections.

### REFERENCES

- [1] Pawar A, Biswas S. Postoperative spine infections. *Asian Spine J.* 2016;10:176–183.
- [2] Chahoud J, Kanafani Z, Kanj S. Surgical site infections following spine surgery: eliminating the controversies in the diagnosis. *Front Med (Lausanne).* 2014;1:17.
- [3] Parchi P, Evangelisti G, Andreani L. Postoperative spine infections. *Orthop Rev.* 2015;7(3):5900.
- [4] Kasliwal MK, Tan LA, Traynelis VC. Infection with spinal instrumentation: review of pathogenesis, diagnosis, prevention, and management. *Surg Neurol Int.* 2013;4(Suppl 5):S392.
- [5] Radcliff K, et al. What is new in the diagnosis and prevention of spine surgical site infections? *Spine J.* 2015;15:336–347.
- [6] Abdul-Jabbar A, et al. Surgical site infections in spine surgery: identification of microbiologic and surgical characteristics in 239 cases. *Spine.* 2013;38:E1425–E1431.

● ● ● ● ●

**Author:** Bryan Alexander

## QUESTION 5: Are there patients with degenerative pathology, such as disc herniations, who are actually infected with a low-grade infection (e.g., *Propionibacterium acnes*)?

**RECOMMENDATION:** The association between the *Cutibacterium acnes* (*C. acnes*) (formerly *P. acnes*) and degenerative spinal disease is inconclusive.

**LEVEL OF EVIDENCE:** Limited

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