Antibiotics for Disc Access

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Myth: The risks of discitis from percutaneous intervertebral disc access and the role of prophylactic antibiotics are clearly defined.

Fact: There is a low but non-zero risk of discitis due to percutaneous intervertebral disc access. Strategies to mitigate this risk include use of strict aseptic technique, use of a needle stylet, and prophylactic intravenous or intra-discal antibiotics.

Incidence of discitis following intentional intra-discal access:
The overall incidence of discitis following intentional percutaneous intra-discal access (“disc access”) in the absence of prophylactic antibiotics has been reported to be 0.24% (1). The majority of available literature is from the 1980’s and 1990’s. Literature that reports 0% incidence of discitis following intentional disc access in the absence of prophylactic antibiotics is largely limited to small cohorts. In 1989, Jackson et al. reported 0 cases out of 124 patients and 231 discs accessed (herein referred to as n=124;231) (2). Notably, this study utilized a transdural approach to the disc. A 2003 study by Willems et al. reported an incidence of 0/200;435 cases of discitis (1). Conversely, other literature reports an incidence of discitis between 0.14% and 1.9% following intentional disc access without prophylactic antibiotics (3) (4) (5). For brevity, only published manuscripts from 1980 onwards are reviewed here. In 1982, Milette and Melanson reported an incidence of 3/500;1009 cases of discitis (3). They cited “improper needle cleaning and rinsing prior to sterilization” as the cause, indicative of a likely dated technique and inadequate aseptic precautions (3). In 1991, Simmons et al. reported an incidence of 1/164;465 cases of discitis. While it is clear that prophylactic antibiotics were not used in the cohorts, other details are limited (4). Most reports predominantly include lumbar disc access, but in 1980 Distelmaier et al. reported an approximate incidence of discitis of 3/800 (0.6%) cervical discography cases (5). Guyer et al. (1997) reported on another cohort of patients who underwent cervical discography, reporting an incidence of 2/161;269 (1.2%;0.74%); in one case, Staphylococcus epidermidis grew from the biopsy culture (6). One of the cervical discography cases ultimately resulted in quadriplegia (6). The available literature regarding clinical presentation and risk of discitis following intentional disc access is limited to a small number of sentinel articles, which are detailed below:

Clinical presentation of discitis following intentional intra-discal access:
Guyer et al. described the clinical presentation of post-procedure discitis, based on the course of nine known cases (7). The most common presentation was increased neck or lumbar axial pain (average time from procedure 17 days, range 3 – 48 days). An elevated erythrocyte sedimentation rate (ESR) occurred post-procedure on day 20 on average (range 30-116 mm/h with most cases above 60 mm/hr). Positive bone scan findings were apparent by post-procedure day 33 on average; 7/9 bone scans performed on post-procedure day 18 were still negative. Two positive cultures were obtained, both Staphylococcus epidermidis. In this study, Guyer et al. also reported on a cohort of 2/2,014;6042 cases of discitis (7). However, the additional nine cases of discitis described were not part of the cohort. This highlights that due to the relatively low risk of discitis, isolated cases may not be captured in small or medium-size cohort studies.

Pathogenesis of discitis following intentional intra-discal access:
Fraser et al. isolated bacteria from the disc in three of four patients with discitis who had open biopsies less than six weeks post discography and detected pseudomonas aeruginosa, Staphylococcus epidermidis, and klebsiella pneumoniae (8). This, in conjunction with the above report by Guyer et al., suggests that discitis following intradiscal injection is caused by the introduction of bacteria present on the skin via the
needle. Corroborating this theory, Fraser et al. noted an initial incidence of discitis of 6/222;463 when using an open needle technique (needle without stylet), which equates to the highest reported rate of discitis in the published literature (2.7%;1.3%). After changing to a two-needle technique and a styletted needle for disc access, the incidence of discitis decreased to 1/149;283 (0.7%;0.3%). In theory, passing a second needle that will penetrate this disc through the cannula of the first needle (that penetrated the skin) decreases the risk of seeding skin flora into the disc. However, it is unclear why, subsequent to this change, an additional 3/61;134 (4.9%;2.2%) cases of discitis were reported during the following two-years. While this one study suggests that the two-needle technique may reduce the incidence of discitis following discography, there is no corroborating evidence to support this.

**Antibiotic properties:**
Klessig et al. studied the properties of proposed prophylactic antibiotics with regard to bacteria thought to represent typical skin flora: *Escherichia coli B, Staphylococcus aureus, and Staphylococcus epidermidis* (9). In an in animal in vitro model, IV cefazolin administered before discography was found to penetrate the intervertebral disc (9). Intradiscal gentamicin, cefazolin, and clindamycin were found to remain efficacious in the presence of iodinated contrast. Minimum inhibitory concentrations were lower for cefazolin and gentamycin than for clindamycin. Interestingly, iohexol alone also demonstrated some inhibition of cell growth (9).

In general, antibiotic coverage should address the typical skin flora thought to be causative. The most commonly cited recommendations for prophylactic antibiotics stem from expert opinion proposing options of cefazolin 1–2 g IV 30 minutes prior to discography or cefazolin 1–10 mg/mL with intradiscal contrast (10). Physicians should also consider allergies and possible colonization with methicillin resistant *Staphylococcus aureus*. Further guidance regarding appropriate bacterial coverage can be found at [https://www.cdc.gov/hai/data/portal/AR-Patient-Safety-Portal.html](https://www.cdc.gov/hai/data/portal/AR-Patient-Safety-Portal.html).

**Use of prophylactic antibiotics:**
There are no head-to-head studies to determine the comparative prevalence of discitis with and without prophylactic antibiotics.

Osti et al. reported on one of the only cohorts of patients who received prophylactic antibiotics before intentional disc access (11). They reported an incidence of discitis of 0/127;133 when intra-discal cephalozin mixed with iodinated contrast was used (1mg cephalozin:1ml of contrast). Follow up in this cohort was conducted at a minimum of three weeks. This study concomitantly reported on a study in a sheep model that compared prophylactic intravenous (IV) antibiotics to intradiscal antibiotics; IV administration resulted in intradiscal penetration of the antibiotic, and there was no difference in the prophylactic effect between the two delivery methods. These investigators also found that when IV antibiotics were started one week after intentional intra-discal contamination and administered for 21 days, bacteria were still present within the disc when the sheep were sacrificed. This is the best published evidence that antibiotics administered after disc injection are not as effective as prophylactic antibiotics and may not provide clinical value.

Pobiel et al. reported on a large cohort of patients that captured different clinical practice patterns (12). Patients from the early portion of the cohort did not receive prophylactic antibiotics and were contacted by telephone up to five days post-procedure. Regular use of prophylactic antibiotics was then instituted, and routine five-day follow-up was discontinued. The overall incidence of discitis was reported to be 6/2085;5981 in the cervical spine, 0/1141;3083 in the thoracic spine, and 2/12,634;37,135 in the lumbar spine. Given the high procedural volume and the fact that follow-up occurred either only five days post-procedure or was not routinely performed, the accuracy of these data is unclear. Details of the two cases of confirmed discitis were provided: the first was a three-level lumbar discography procedure in which antibiotic was not used due to possible allergy. Provocation of the two lower disc levels produced typical, concordant low back pain and were treated with intradiscal steroid without complication, but *Staphylococcus epidermidis* discitis developed in the healthy control L3–4 disc. The second case involved a three-level lumbar discography procedure wherein intradiscal gentamycin was used instead of cefazolin because of allergy to both penicillins and cephalosporins. Six-weeks post-procedure, the patient presented with worsening back pain, “somewhat different from her chronic pain” and a disc biopsy was inconclusive (12). If the latter was indeed a case of discitis, it would be the only such captured in a cohort in which prophylactic antibiotics were used.
The unknown:
The available literature almost exclusively pertains to intentional disc access for the purpose of discography. It is unclear how these data pertain to disc access for other reasons.

Specifically, when disc access is inadvertent, such as during a transforaminal epidural steroid injection, it is likely that strict aseptic precautions were not present during the procedure, perhaps increasing the risk of infection. There is also no literature demonstrating that administering intradiscal, IV, or oral antibiotics after unintentional disc access prevents infection. This practice may be warranted to minimize the risk of infection given the morbidity associated with discitis but is not based on published evidence.

Similarly, the effect of prophylactic antibiotics during other procedures that include intentional disc access for therapeutic reasons, such as biologic treatments, has been sparsely reported in the literature. A case series of 15 patients undergoing intradiscal injection of fibrosealant fibrin reported a single case of post-injection discitis (*Haemophilus parainfluenzae* types 1 and 2, *alphahemolytic Streptococcus* sp., and nonpathogenic *Neisseria* sp.) (14). There is a single report of discitis (*Cutibacterium acnes*) following L5-S1 intradiscal platelet rich plasma injection (15). While the effects of antibiotics on the viability of the biologic products once inside a relatively avascular structure are unknown, these cases highlight the risk of potential discitis occurring with these procedures.

Conclusions

- The risk of discitis occurring after intentional disc access is non-zero, with reported rates ranging between 0.4 and 1.9% when performed in the absence of prophylactic antibiotics.
- The literature suggests that if discitis occurs, it is likely due to bacteria commonly colonized on the skin.
- The available literature suggests that this risk of discitis is lower when prophylactic antibiotics are used, but this is limited to only 2 cohort studies.
- The risk may differ depending on cervical vs thoracic vs lumbar segments.
  - If prophylactic antibiotics are used, medications that cover typical gram-positive skin flora should be used.
    - Other resources suggest administration of Cefazolin 1–2 g IV 30 minutes prior to discography and/or cefazolin 1–10 mg/mL with intradiscal iodinated contrast
  - There is no published literature pertinent to the use of antibiotic administration following inadvertent disc access. One must balance the low, but serious risk of potential discitis against the inherent risk with giving antibiotics.
  - Utilizing strict sterile/aseptic conditions and utilizing chlorhexidine solution prep according to the manufacturer recommendations are strongly recommended prior to disc access.

References


