Percutaneous surgical treatment of Chance fractures using cannulated pedicle screws

Report of two cases

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† Chance fractures are relatively rare injuries and can be treated either conservatively, with a cast, or surgically, especially when posterior ligament injury is present. This paper presents two cases of lumbar Chance fractures treated using recently developed percutaneous cannulated pedicle screws. The first patient suffered associated abdominal injuries that required surgery, while the second had associated stable spinal fractures. Intraoperative blood loss was minimal. Both patients progressed to osseous union without implant failure. Following minimally invasive implant removal 9 months after injury, both patients remained asymptomatic without any evidence of instability on flexion and extension images obtained during their latest follow-up. This technique may be useful in selected cases in which bone grafting is not necessary; it allows early mobilization and stable fixation while minimizing morbidity.

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KEY WORDS • minimally invasive surgery • pedicle screw fixation • spinal fracture • thoracolumbar spine

In 1948, Chance described a “horizontal splitting of the spine and neural arch” by a fracture line extending through the vertebral body, pedicles, and posterior spinal process. Later, Gumley et al. reviewed distraction fractures of the lumbar spine and proposed a classification system (Types I–III) with increasing ligamentous involvement. Treatment for Chance fractures depends mainly on the perceived stability of the injury. The majority of Chance fractures reported in the literature have been treated conservatively with a body cast. Less invasive surgical techniques requiring minimal dissection, and thus less trauma to soft tissues, have been developed, allowing for the percutaneous introduction of PSs. The advent of such systems makes it possible to include surgical treatment options for fractures that in the past might have been limited to conservative treatment. In this study, we present two such cases of Chance fractures treated surgically with this new minimally invasive surgical technique.

Abbreviation used in this paper: PS = pedicle screw.
mobilized the following day using a Jewett orthosis, which was then worn for 8 weeks. A computed tomography scan obtained 9 months postoperatively showed satisfactory osseous healing (Fig. 2). The PSs and rods were removed at that point with the use of specialized retractors (METRx, Medtronic), using the same stab incisions as previously described. (1) (These retractors were initially developed for microendoscopic discectomy.) At 1 year postinjury, flexion/extension lateral views of the spine showed no instability (Fig. 3), and the patient had no complaints.

Case 2

History and Presentation. This 20-year-old man was admitted to our institution following a motor vehicle accident in which he suffered a Chance fracture of L-2 (Type B2.1 according to the classification system of Magerl et al.) and associated stable compression injuries at T-4 and T-12. He also suffered a bilateral pneumothorax requiring insertion of chest drains.

Operation and Postoperative Course. Two days after the injury, following the induction of general anesthesia, the L-2 fracture was reduced indirectly on the operating table through hyperextension, and a percutaneous fixation from L-1 to L-3 was performed using the Sextant (Medtronic) percutaneous pedicle stabilization system (Fig. 4). As in Case 1, no bone grafting was performed. The operation lasted 70 minutes, and no measurable blood loss was recorded. The patient was treated postoperatively with an external lightweight orthosis for 2 months, mainly due to the presence of the associated spinal fractures. Implant removal was performed 9 months postinjury as previously described in Case 1 using stab incisions. At the latest follow-up visit, 1 year postinjury, the patient was asymptomatic and his x-ray films showed satisfactory osseous healing of all the vertebral injuries.
Discussion

Treatment of Chance fractures, which are in essence flexion distraction injuries, has been discussed primarily in case reports dealing with this relatively rare injury. In the majority of those cases, reduction in hyperextension was performed and a body cast was used for at least 3 months. This is certainly a safe option for this type of injury. In the presence of posterior ligament lesions, surgical intervention with segmental instrumentation has been advocated. Furthermore, in a small series, better clinical results were reported with surgical treatment compared with nonsurgi-

Fig. 3. Case 1. Postoperative lateral extension (left) and flexion (right) radiographs of the lumbar spine obtained 1 year after injury.

Fig. 4. Case 2. Lateral radiographs of the lumbar spine showing the L-2 Chance fracture before (left) and after (right) reduction and instrumentation placement.
cal therapy. It was thought that associated intraabdominal injuries were present in nearly 90% of the cases in that series. More recently, the authors of a multicenter review of 79 trauma patients with Chance fractures showed a 33% incidence of intraabdominal injuries and reported that 25% of the 79 patients underwent laparotomy. Using a body cast immediately after a laparotomy may be problematic because of the possibility of postoperative complications that might require monitoring and treatment. As far as our second case was concerned, it was felt that the presence of two adjacent injuries would necessitate the use of a plaster cast if the injuries were not treated surgically; following surgical stabilization of the fracture, a less cumbersome orthosis could be used. We felt that surgery using a minimally invasive approach had certain advantages over nonsurgical treatment in the two cases presented. Operating time and blood loss were minimal compared with operating time and blood loss in standard open procedures. It could be argued that in using an open technique with hooks and the application of compression, a unisegmental fixation can also be achieved, obviating the need for implant removal. However, such a technique would still result in permanent immobilization of a motion segment, which may not be desirable in young patients. Furthermore, the open technique requires more soft tissue dissection and entails additional blood loss, both of which can be avoided with the percutaneous technique.

It should nevertheless be noted that this type of fixation may not be applicable to other types of fractures. Both patients in the cases presented in this article suffered a transverse bicolumn injury, a Type B2.1 injury according to the classification system of Magerl et al. This is a purely osseous injury and has excellent healing potential. Other Type B injuries with posterior ligament involvement, disc lesions, or associated significant anterior column involvement, may not be suitable for minimally invasive fixation because bone grafting cannot be performed. In addition, Type A injuries may be less suitable for minimally invasive fixation for similar reasons, as well as the added difficulty in obtaining reduction by ligamentotaxis.

In summary, the good outcome in our two cases is encouraging and leads us to recommend it for similar cases. To our knowledge, the two cases presented in this article are the only ones reported in the literature using this type of approach for the treatment of Chance fractures.

Disclaimer

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References


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