EVERAL authors have demonstrated the effectiveness of anterior screw fixation for recent and remote odontoid fractures.\textsuperscript{1,4–6} We have used a new simple tubular retractor system affixed to the side rail of the operating table. The system was developed for endoscopic lumbar microdiscectomy (METRx; Medtronic Sofamor Danek, Memphis, TN) and adapted for odontoid screw placement as described below.

Surgical Technique

The surgical technique is similar to one previously described by the senior author (V.K.H.S.).\textsuperscript{3} Before the skin is incised, the flexible arm of the system is attached to the 18-mm tubular retractor, and the bed rail is mounted contralateral to the surgeon (Fig. 1). Dissection down to the anterior aspect of the C-5 VB is undertaken in the usual fashion. Hand-held retractors are used until rostral dissection exposes the C2–3 disc space. The 16.8-mm-diameter dilator tip is then placed at the desired entry point, and the trajectory is confirmed using biplanar fluoroscopy. The tubular retractor is placed over the dilator until flush with the VB. After fluoroscopy confirms that the position is appropriate, the dilator is removed, establishing a tubular operative corridor. At this point, the K-wire preset in the drill is placed through the tube. Biplanar fluoroscopy again confirms the positioning. If necessary, the entry point, trajectory, or both can be adjusted by slightly loosening the retractor arm in a semifixed status and then retightening it. After fluoroscopy confirms the appropriate position of the K-wire, a 38-mm self-tapping titanium lag screw is placed to reduce the fracture fragment (Fig. 2).

Illustrative Case

History. This 35-year-old man fell over the handlebars of his bicycle. He complained of severe neck and thoracic back pain. He was initially evaluated at an outside emergency room and later transferred to our institution.

Examination. On examination, he was tender to palpation in the upper cervical and midthoracic spine but exhibited no neurological deficits.

Cervical radiography and computerized tomography scanning demonstrated a minimally displaced Type II odontoid fracture (Fig. 3) combined with T-4 and T-6 compression fractures.

Treatment and Operation. The patient was placed in a halo vest to establish realignment of the odontoid fracture and discharged from the hospital. At a 6-week follow-up examination, he complained of persistent neck pain. Upright and supine cervical radiographs revealed movement of the odontoid fracture fragment. After magnetic resonance imaging confirmed that the transverse ligament was intact, the patient underwent successful placement of an odontoid screw through the tubular retractor (Fig. 4). He was discharged without swallowing or speech difficulties.

Postoperative Course. Three months after surgery the patient experienced no neck pain, and radiographs demonstrated a stable alignment and construct.

Discussion

The risks associated with anterior odontoid screw fixation are primarily related to the technical demands of the procedure. The required exposure and the relatively blind passage of the screw are the greatest sources of complications.\textsuperscript{2} In this radiographically guided procedure, proper trajectory is a key aspect for successful screw placement.

Abbreviation used in this paper: VB = vertebral body.
Typically, when standard retractors are used for odontoid screw placement, a second rostrocaudal (mandibular) retractor is necessary. Two soft-tissue retractors may necessitate frequent readjustments. This process can require an assistant so the primary surgeon can maintain appropriate landmarks for placement of the K-wire, odontoid screw, or both.

The table-mounted tubular retractor system has several advantages. First, it is rigidly fixed. Its position is not subject to the anatomical constraints of the patient. This system permits fine adjustments of the entry point and trajectory without requiring dismantling of the entire retractor setup. The fixed arm can be partially loosened and the tubular retractor redirected by sliding along the VB in a mediolateral or rostrocaudal fashion. Once the retractor is rigidly fixed in the appropriate position, the operation can proceed without further adjustments of the retractor. A single retractor decreases clutter in the operative field. Retraction against the esophagus, trachea, recurrent laryngeal nerve, and carotid artery is minimal. Furthermore, no dissection of the longus colli muscles is necessary. The
neck incision may be smaller than that in the standard procedure because the exposure does not need to accommodate a three- or four-blade retractor system.

The tubular retractor system allows maximal intraoperative visualization and rigid fixation of the retractor with the capability of making minor adjustments to the position of the retractor in a simple fashion. This system may help relieve some of the technical demands of maintaining the appropriate screw trajectory, especially in patients who are obese or barrel chested. The major advantage of this system is in its simplicity and ready availability in any operating room.

Disclosure

This retractor system is manufactured by Medtronic Sofamor Danek. The authors have no proprietary interest in the instrument.

References


