LATERAL MASS POSTERIOR CERVICAL FIXATION:
A PROSPECTIVE ANALYSIS OF 612 CONSECUTIVE SCREWS IN 95 PATIENTS
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PURPOSE OF STUDY
Lateral mass screw fixation in the subaxial spine is a relatively new technology available for the management of cervical disease. As with every instrumentation system there are inherent risks of neurovascular injury which may potentially complicate this technique. This study evaluates the results, indications, outcomes and complications of 612 sequential lateral mass screws inserted in 95 patients by a single surgeon. Recommendations in terms of technique modification are also given.

METHODS
Over a 35 month period a total of 612 lateral mass screws were placed in 95 patients aged 12 – 96 years (56 males and 39 females), for a wide variety of conditions (see figure 3). All patients underwent screw insertion by a single surgeon using lateral fluoroscopic control (see figure 1,2 and 8 for trajectory). All patients had postoperative CT scans performed within the first week after surgery to evaluate screw position and all patients had clinical and radiographic follow-ups performed at the following time periods: day 1, 6 weeks, 3 months, 6 months, 12 months and 2 years. Follow-ups ranged from 12 months to 3 years. Patients were assessed for any immediate complications. Screw position was assessed by an independent observer. Criteria for vertebral artery injury included intraoperative identification of arterial bleeding, stroke related to screw placement or radiological appearance of invasion of the foramen transversarium by the screw tip by more than 1 mm on axial CT scanning.

All screws were placed by a modification of the Magerl and An technique (see figures 1,2 and 8) but 6 screws were converted to Roy-Camille trajectories because of screw pullout. A total of 68 C7 lateral mass screws were placed without the need for pedicle screws at this level. 44 patients underwent instrumentation with a screw/plate construct whereas the last 51 patients all utilized a multiaxial screw/rod construct. The features of these constructs are shown in figures 4-7 and in the table. Local posterior element autograft was utilized in most cases, sparing iliac crest. A fusion rate of 98.8% was found with 10% of patients preoperative smokers. In myelopathic patients Nurick grades improved by 0.99. No patients suffered neural injury or vertebral artery injury as a result of screw placement. There were 4 deaths: 1 due to massive pulmonary trauma, 1 due to disseminated malignancy and 1 due to unrelated intracranial hemorrhage 7 months after surgery. Four superficial wound infections occurred. Three patients had screw pullouts using the Axis® system which did not require reoperation (see figure 9). These all occurred in smaller more osteoporotic C3 lateral masses. Postoperative CT scanning showed no compromise of the foramen transversarium or neural foramen. One patient to date developed a postlateral disc bulge at C6/C7, below a C6A fusion, 13 months after the initial surgery, which responded to a posterior foraminotomy and decompression and one patient required extension of laminectomy for residual compression. The incidence of adjacent segment disease requiring surgical intervention was 1.1%.

CONCLUSIONS
This study demonstrates the safety and efficacy of lateral mass fixation for a range of cervical pathologies. In most cases of subaxial disease, non-cannulated plate/screw systems provide a cheaper alternative to polyaxial screw/rod constructs and can be used effectively. These however come with a 3% incidence of kyphosis. Incidences of screw breakage are exceedingly low and pullout is more common. The incidence of adjacent segment disease at 1.1% is to date lower than that seen with anterior constructs, possible because of the ‘springboard’ effect of a posterior placed arthrodesis that may allow movement anteriorly in the disc space. Most patients can be instrumented using a modified Magerl technique with 14 mm length x 3.5 mm diameter screws. Four mm screws should be reserved as rescue screws. The C7 lateral mass can be cannulated with an adjusted trajectory allowing for the shallowness of the lateral mass. The incidence of neurovascular injury with this technique should approach zero and multilevel fixation can be performed quickly and safely with or without radiographic control. Finally, the use of local posterior element autografting avoids the morbilities associated with iliac crest graft harvesting.

This technique provides an exciting straightforward tool for the management of cervical spondylosis.