

# Application of Allen spine system in intraoperative three-dimensional image (O-arm) based navigation surgery

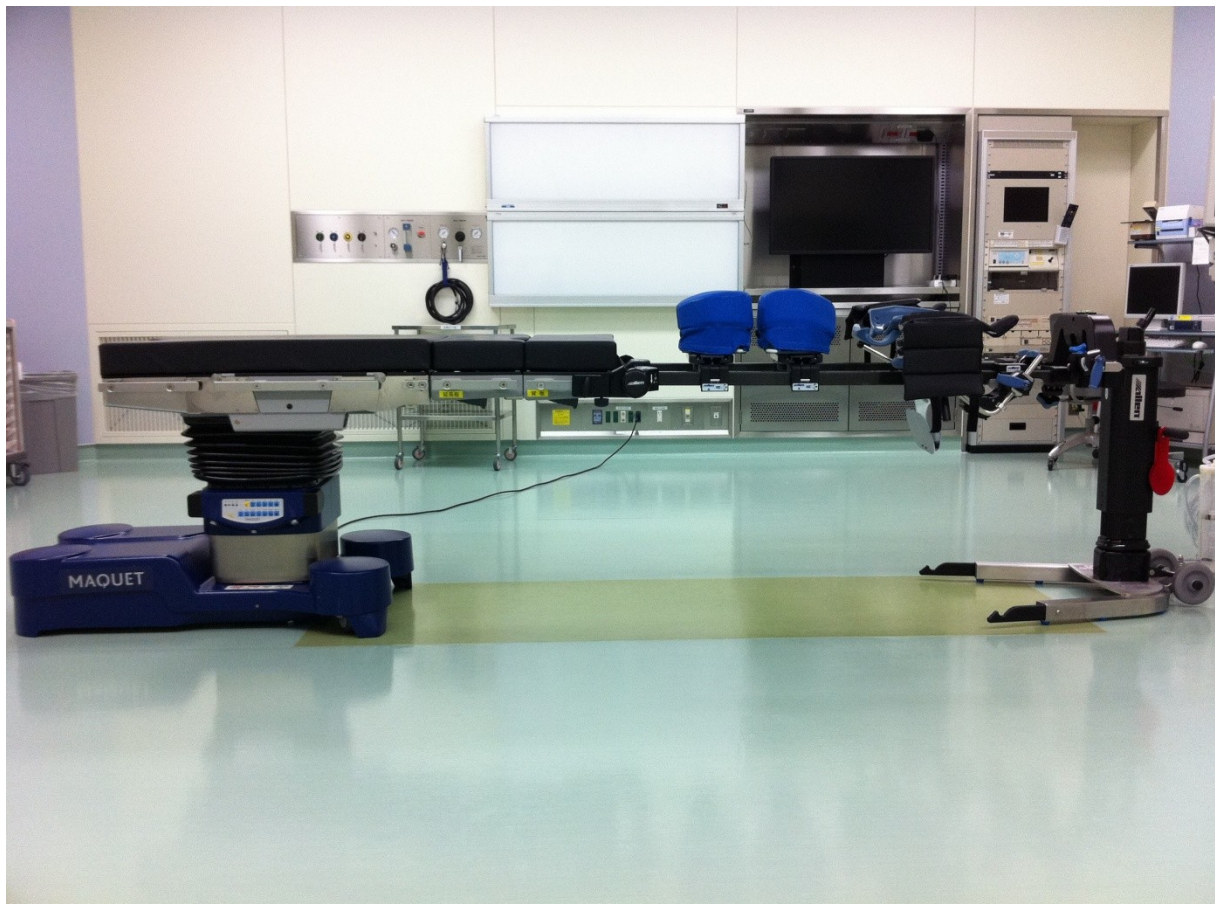
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**Background:** Pedicle screw instrumentation in spine surgery has spread over the last decade because several authors reported the advantage of pedicle screw over hook in terms of the ability to achieve 3-column fixation, to derotate the spine, and improved coronal balance, having lower pseudarthrosis and implant failure rates. The extensive use of two-dimensional and three-dimensional navigation systems during the last decade has assisted spinal surgeons in performing complex surgeries using pedicle screws in a safer and less way. The latest development is the O-arm (Medtronic) –assisted spinal navigation, which is the only technology that includes the acquisition of high-resolution images and 3D data sets on the operating table and allows fully automatic registration. However, obtaining 3D data intraoperatively restricts operating table. In order to perform computed tomography during O-arm surgery, a 360 degree transparent X-ray without a bar is a requirement of the table. To aid in this achievement of complete radiolucency, the Jackson Spinal Table (Mizuho OSI) has been widely used in combination with the O-arm. At present, there are no reports in the literature comparing the Allen Spine System (Allen Medical Systems) to the Jackson Spinal Table in O-arm-assisted spinal navigation surgery.



The purpose of the present study is to investigate the usefulness of the Allen Spine System in intraoperative 3D image-based navigation surgery.

**Methods:** There are certain requirements for an operating table to be considered usable in an O-arm surgery setting. Firstly, to perform navigation surgery from the cervical to the lumbar spine, the O-arm has to be moved into the surgical field, and adequate radiolucent space without an intervening bar is necessary to allow for 360 degrees of radiolucent access. Secondly, after the scanning CT, the O-arm needs to be moved out of the way in order to keep the surgical field sterile and to not interrupt the operation. The Allen Spine System meets these two conditions.

Previously, we operated on a Maquet operating table. The O-arm can be attached to this model, lowering the cost of this system as we did not need to buy a new table. This was the primary consideration when we decided to use the Allen Spine System for O-arm navigation surgery in December 2010.

**Results:** We have been using the Allen Spine System in spinal navigation surgery with the O-arm in cases (e.g. scoliosis surgery) for almost one year in the spine center. We have found both advantages and drawbacks of the Allen Spine System. The table is useful for viewing any part of the spine between the cervical and lumbar spine with ease. Patient positioning and alignment are not a problem, helping to reduce the incidence of pressure ulcers and nerve injuries. However, the large size of the Allen Spine System when attached to Maquet operation table occupies much more space compared with the conventional Jackson table.

**Conclusion:** In conclusion, the Allen Spine System performs comparably to the conventional Jackson table for O-arm cases, with some additional benefits. It can be adapted to an existing table, and is considerably less expensive than the Jackson model. The Allen Spine System is useful for making O-arm surgery easier and safer.