Application of a Surgical Navigation System in the Musculoskeletal Tumors
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Introduction: Resection of sacral tumor is one of the most difficult surgeries in the orthopaedic oncology, because the complex anatomy and around important organs that could be interfere satisfactory surgical resection. Up to now we have been faced many patients that have functional impairement with neurologic deficits and poor oncologic outcomes with frequent local recurrences after sacral tumor surgery. The navigation system could minimize the functional impairment as well as ensure the precise surgical resection with adequate margin. A soft tissue sarcoma located closely on ribs, spines may be confused intraoperatively that which ribs or spines were involved. Navigation system could show soft tissue tumor boundary and depth, and adjacent bone involvement point especially similar bone arranged area, like ribs or spines.

Materials and Methods: Recently two patients had an operatione with navigation system. A 52 year-old man with right first and second sacral ala confined intramedullary bone tumor was diagnosed chondrosarcoma, the other 59 year old man with soft tissue tumor on the thoracic back with close to scapular, ribs and spinous processes of thoracic spine was diagnosed recurred rhabdomyosarcoma. Before the sacral surgery four K-wires were placed in both iliac crests and posterosuperior iliac spines under the local anesthesia in the operating room and a spiral CT with prone position was obtained. Before the back surgery six fiducial markers attached thoracic back skin and check the MRI with prone position.

Results: The operation was performed under the Navigation system (CART 2, Stryker, USA). Wide excision can be possible for sacral ala confined chondrosarcoma through only posterior approach without lumbo-sacral nerve roots injuries and functional deficit. Also wide excision was possible for thoracic back rhabdomyosarcoma with exactly recognize of the range of soft tissue boundary and their bone attachment points of two ribs and two spinous processes.

Discussion: Recent improvement of diagnostic modalities facilitates better surgical planning and helps us to perform planned surgery. Currently computer-aided surgery (CAS) has been used for orthopaedic surgery such as, cruciate ligament reconstruction, hip and knee arthroplasty and pedicle screw application. Application of navigation system in the musculoskeletal tumor is expected that could be provide improved oncologic and functional outcomes through intraoperative monitoring of boundary of bone and soft tissue tumor with related around important structures. An addition, surgical team and patient can be protected from frequently using C-arm radiation. In the future, we could extend the application of navigation system to treatment of musculoskeletal tumors especially around joint or growth plate.

Fig. 1. This photographs showed the process of navigation surgery for a 52 year old man who had sacral chondrosarcoma.

Fig. 3. This photographs showed the process of navigation surgery for a 59 year-old man who had recurred rhabdomyosarcoma on thoracic back.

Fig. 2. Wide excision of sacral condrosarcoma was performed without nerve roots injury through only posterior approach.
