Frozen recapping laminoplasty: a new technique to treat spinal tumor


Department of Orthopedic Surgery, Kanazawa University, Kanazawa, Japan
Background

Recapping T-saw laminoplasty is performed as treatment for any type of spinal tumor and provides extensive exposure for tumor removal. Tomita and Kawahara et al. reported successful results with recapping T-saw laminoplasty.

Photograph showing the Gigli saw, the thread-wire saw, and 1-0 Dexon (polyglycolic acid) suture thread. Drawings showing the operative technique for recapping laminoplasty with use of the thread-wire saw. The thread-wire saw is introduced with use of a T-saw guide (left side of spine), and the pedicle is cut through the transverse process (right side of spine).

We applied this technique to frozen autograft using liquid nitrogen for complete resection of spinal tumor.

Reconstruction using an autograft containing tumour treated by liquid nitrogen

Tsuchiya et al. reported that reconstruction using frozen tumor-bearing bone is a safe and effective method; no local recurrences from tumor-bearing autografts have been reported. Using frozen autografts has various advantages, including low cost, maintenance of osteoinductive and osteoconductive properties, good fit between graft and host bone, and no transmission of disease or immunological rejection.


12-year-old, girl: Osteosarcoma of proximal tibia
2y2m: Normal Function!
A 35-year-old woman was diagnosed with papillary thyroid cancer, and a right lobectomy was performed. One month after surgery, the patient underwent an FDG-PET study to evaluate the extent of the disease. PET/computed tomography (CT) showed an incidental FDG-avid lesion in the T7 lamina with an SUV max of 10.4, suggesting metastatic disease from thyroid cancer. The patient was referred to our hospital for excisional surgery of the T7 spinal tumor. CT revealed a 2.0 × 2.0-cm lytic bone lesion involving the left T7 vertebral lamina, pedicle, and T6-7 facet joint. A heterogeneous hypointense lesion was revealed on T1-weighted magnetic resonance imaging (MRI), and T2-weighted sequences also revealed a low-intensity lesion. Gadolinium-enhanced MRI demonstrated a uniformly enhancing mass.
The surgery was performed via a posterior approach. In the first step, en bloc resection of the left T6 spinous process and left inferior articular process, including the tumor, was performed. The thread-wire saw is introduced with use of a T-saw guide.
Thereafter, en bloc resection of the posterior element of T7, including the tumor at the left superior articular process, was performed via pediculotomy on the side of the tumor as well as cutting from the pedicle to the transverse process on the opposite side of the tumor, using a flexible multifilament thread-wire saw (T-saw; Promedical Co, LTD, Kanazawa, Japan). En bloc laminectomy provided extensive exposure for tumor removal, and piecemeal total resection of the residual tumor was performed at the left T6/7 foramen.
After en bloc laminectomy, the tumor and soft tissue were curetted away from the resected lamina. Then, the resected lamina was frozen with liquid nitrogen for 20 min and then used as a frozen autograft for spinal reconstruction with posterior instrumentation.
Pathological analysis revealed synovial-type tissue with a fibrohistiocytic reaction. Small mononuclear cells showing spindle- to oval-shaped nuclei were diffusely distributed and mixed with several multinucleated giant cells, which is characteristic of TGCT-D. There was no evidence of malignancy. Immunohistochemistry showed that the majority of cells were vimentin- and CD68-positive, but negative for CD1a, CD3, CD20, CD138, and S-100.
Postoperative radiography and computed tomography images obtained 3 years after spinal surgery. At the 3-year post-surgery follow-up, there was no loosening of the posterior instrumentation. Bone union after frozen recapping laminoplasty was obtained (white arrows).

At the 2-year post-surgery follow-up, MRI revealed no evidence of local recurrence.
Reconstruction using frozen autograft for spine surgery

None of the patients had recurrence from the liquid nitrogen-treated tumor-bearing autograft.


This reconstruction technique has been concurrently performed in total en bloc spondylectomy at our institute since 2010 for the patients with spinal metastasis. This technique eliminates graft harvest site morbidity, decreases blood loss, and shortens surgical time.
Conclusions

Using frozen autografts has various advantages, including low cost, maintenance of osteoinductive and osteoconductive properties, good fit between graft and host bone, and no transmission of disease or immunological rejection.

The combination of recapping laminoplasty and reconstruction using a frozen tumor-bearing vertebra may offer an ideal surgical option for the complete resection of spinal tumors, as shown in the present case, in terms of prevention of local recurrence and preservation of the posterior spinal elements.

Disclosure
I have nothing to disclose.

Department of Orthopedic Surgery, Kanazawa University, Kanazawa, Japan