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## Recycled autograft augmented with vascularised fibular graft for reconstruction of bone defects caused by tumor resection

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Recycled autograft for reconstruction of skeletal defect by wide resection for the malignant tumors has been widely used in Asian countries. It has the advantages of using the patients' own bone and providing a good skeletal fit. It has neither donor site morbidity nor risks of disease transmission, and the cost of the treatment is expected to be cheaper comparing to other modalities using mega-prosthesis or allograft.

However, recycled autograft is usually mechanically weak and brittle due to devitalizing process. Heat processing, either autoclaving or pasteurization destroys the BMPs as well, and decreases the mechanical properties. It has been reported a disadvantage of long duration of bone union and high incidences of non-union and fracture. To keep the biologic properties within the recycled bone, it is less processing, and then it increases the risk of the tumor cells survival. Actually, there are a few reports of local recurrences due to tumor cells survival within the recycled autograft in spite of devitalizing process. Thus, confident devitalizing process is mandatory.

To minimize the complications of reconstruction using recycled autograft, it may be augmented with vascularized bone graft. The vascularised fibular graft (VFG) provides the immediate restoration of a physiological blood supply and supplementary stability, and then the cellular elements of the grafts can survive to enhance the bone union and support the strength of the recycled autograft.

We evaluated the outcomes of surgical reconstruction using recycled autograft augmented with VFG for bone defects caused by tumor resections.

Twelve patients with malignant bone tumors who were managed with recycled autograft augmented with VFG and followed up minimum 2 years were evaluated for bone union, functional results and complications. The influence of various factors on bone union and functional outcomes were also analysed. Bone union were obtained at 3.7 months at metaphyseal junctions and 8 months at diaphyseal junctions ( $P < 0.05$ ). At diaphyseal junctions, younger aged group and intramedullary location group showed earlier bone union ( $P < 0.05$ ). The mean functional score was 81%. There were 3 non-unions, 4 delayed unions and 2 recycled bone resorption combined with fractures, although those complications were eventually solved with re-fixation and autogenous bone graft.

In conclusion, recycled autograft for reconstruction should be used for the cases of limited amount of bone destruction, such as tumor contamination of cortical bone due to malignant bone and soft tissue sarcomas.

To obtain excellent results, proper microvascular technique, sufficient length of VFG bridging both junctions, stable internal fixation and proper protection of reconstructed bone until union are necessary.

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