The Use of an Ultra-porous Bone Graft and Platelet Concentrating System in the Surgical Correction of a Non-ossifying Fibroma

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Introduction - CASE HISTORY

Benign fibrous and cystic lesions of bone usually develop during childhood through adolescence in the metaphyseal and/or metadiaphyseal region. Lytic defects and can be subdivided into three basic pathophysiologic groups: 1) Central Intramedullary Lesions, 2) Fibro-osseous Lesions, and 3) Eccentric Lesions, such as non-ossifying fibromas. Most lesions resolve unremarkably, without requiring intervention.[1]

However, on investigation of bunion pain in a 16 year old female, a tibial lesion was discovered on x-ray. Three years prior on a previous x-ray the lesion was approximately 15% of its current size. No current nor past history of pain was reported. Due to the patient's competitive athletic activities, the size of the lesion, and CT evidence of a cortical fracture the decision was made to surgically curette and pack the tumor.

Prior to surgery an CT and musculoskeletal oncology consult were ordered, which collaborated a preliminary diagnosis of a non-ossifying fibroma.

Fig. 1. Initial incidental x-ray finding in March 2001.

Fig. 2. X-rays from June 2004 office visit.

Aims

1) Surgically curette and pack the lesion to prevent a tibial fracture in the future, due to the patient's athletic demands.
2) Use a bone graft the would provide rapid and steady incorporation.
3) Stimulate bony infiltrate over time to fill the substantial tibial defect.
4) Full weight bearing in 8 weeks and return to sports in 4 months.

Material and Methods

The surgical procedure was carried out using a lateral tibial approach and anterior orientation to the syndesmosis. Care was taken to preserve the anterior tibial neurovascular bundle as a cortical window created in the tibia.

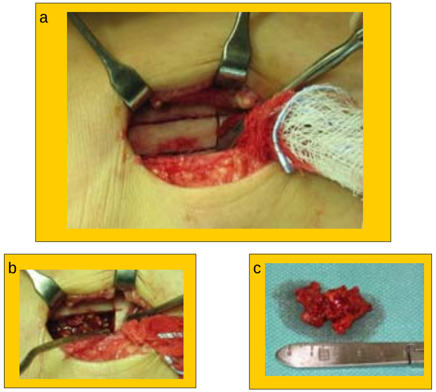


Fig. 3(a-c). The cortical window which provided access to the lesion. The cortical window was removed and the lesion is readily evident. Firm red-tan tissue with yellowish deposits.

After the lesion was curetted, the tibia was fenestrated to provide a bone marrow aspirate, then packed with ultra-porous tri-calcium phosphate (TCP) bone graft and the GPS™ System. The cortical window was replaced and the patient was placed non-weight bearing status for 8 weeks.

Fig. 4. The GPS™ System adapts to the plasma/red cell interface with a floating buoy. The buoy mechanism is engineered to separate the plasma/red cell interface by reacting to the density of each layer.

Results and Discussion

A definitive diagnosis was not available from the hospital, therefore a specimen from the lesion was sent to the Armed Forces Institute of Pathology and it was determined to be a non-ossifying fibroma. Results indicated the presents of uniform spindle cells in a Storiform pattern (see Fig. 6) that are consistent with the formation of non-ossifying fibroma.[2,3]

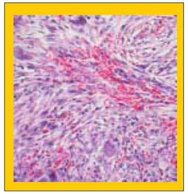


Fig. 5. Pathology slide demonstrating the Storiform pattern.

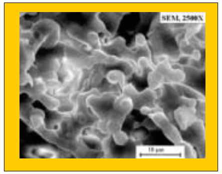
To stimulate rapid bony infiltrate, the GPS™ System was utilized. Platelets react with the fibrinogen to form fibrin threads. These threads form a web-like mesh that trap blood cells and bone marrow. This fibrin clot forms in the porous bone graft and triggers the platelets to degranulate, releasing growth factors, which in turn stimulate bone growth.

Table 1. A study by KIM[4] examining the differences between bone substitutes.

Source	Osteo-conduction	Osteo-induction	Osteo-genesis
Autograft	3	2	2
Ultra PTCP/BMA	3	2	2
Allograft	3	1	0
TCP,HA	1	0	0
CP Cement	1	0	0
DBM	1	2	0
Collagen	2	0	2

DBM=demineralized bone matrix, TCP= tricalcium phosphate; BMA= bone marrow aspirate; HA= hydroxapitite; PTCP= porous tricalcium phosphate; CP= calcium phosphate. 3 point scale.

Fig. 6. Electron microscope magnification of ultra-porous tri-calcium phosphate at 2500X



Although a bone autograft is the gold standard, comparable substitutes, such as ultra-porous TCP with a bone marrow aspiration can be used with excellent results.[4] Note the steady and consistent incorporation of the bone graft in Figs. 7 & 8. Other bone substitutions may absorb after 4-6 mouths leaving a void of fibrous tissue and minimal structural support.[4]

Finally, our patient healed her cortical window after 10 weeks post operatively and she returned to her regular sports activities 4 months post operatively.

Fig. 7. Four weeks post operatively.

Fig. 8. Twelve weeks post operatively.

Literature cited

1. Alguacil-Garcia, A., Alonso, A., Pettigrew, N.M.: Case Reports. Osteofibrous Dysplasia (ossifying fibroma) of the tibia and fibula and adamantinoma, Am. J. Clin. Pathol. 82:470-474, 1984
2. Johnson, L.C.: A general theory of bone tumors. Bull. N.Y. Acad. Med. 9:164-174, 1953.
3. Spjut, H.J., Fechner, R.E., Ackerman, L.V., tumors of bone and cartilage. In: Atlas of Tumor Pathology, Supplement to Fascicle 5, Second Series. Washington, D.C., Armed Forces Institute of Pathology pg 16-18, 1981.
4. Kim, D.H., Jenis, L, Berta, S.C., et. al. Bone Graft alternative in spinal fusion surgery. Current Opinions in Orthopedics, 14(3) 127-37, 2003.

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