
Use of Irradiated Tri-corticocancellous Allograft Bone in the Reconstructive Surgery for Non -Tumorous Bone Lesions in Pediatric Population

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가 (autograft bone) 가 (curettage) en bloc
가 , 가 가 가
(allograft bone) 가 가
가 가
가 가
가 가
가 가
(dead bone) 가 가
가 20 180
가 (pseudoarthrosis) (bending
가 (strength) (torsional strength)
가 가

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10 ~ 20%

¹⁾

20% 가 가

55 ~ 90%,

39% 가

(rehydration)

(longitudinal

crack)

(hoop strength)

²⁾

(gamma irradiation)

3 Mrad (

1.5 ~ 2.5 Mrad)

가

85%

⁵⁾

AIDS

⁸⁾ 3 Mrad

가

bone morphogenetic protein

^{6,7)}

(elastic modu-

lus)

cross links

free

radicals

peptide bonds

(revascularization),

(creeping sub-

stitution)

(remodelling)

¹¹⁾

Hamer

가 가

⁵⁾

가

(osteoinductive)

(internal fixation devices)

가

(osteoconductive)

(structural

(bone loss)

allografts)

(bone defects)

(revisional joint arthroplasty)

(bone filler)

(surgically altered bone

areas)

(strut graft)

25%

35%

^{4,10)}

(tri-corticocancellous allograft

bone)

(solvent)

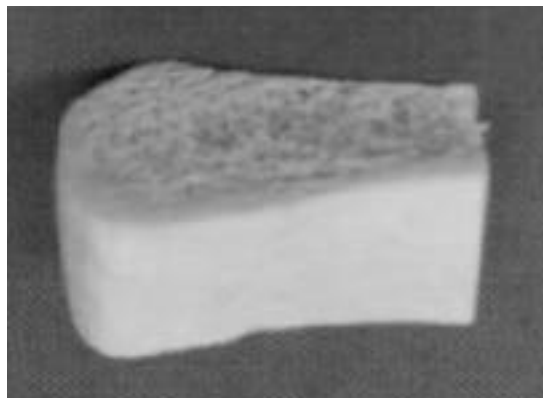


Fig. 1. Commonly used human iliac crest bone wedge, which is solvent-dehydrated and gamma-irradiated preserved. It should be rehydrated prior to use by soaking in 0.9% saline solution for a minimum of 30 minutes.



Fig. 2. Neglected right hip dislocation in a 9-year old-boy. **A:** Anteroposterior radiograph and three-dimensional computed tomographic scan showing dislocated right femoral head and posterior acetabular deficiency. **B:** Intraoperative photograph showing inserted graft into the osteotomy site in the acetabulum. **C:** Anteroposterior radiographs taken at 18 months postoperatively showing well-maintained femoral head and corrected dysplastic acetabulum.

(gamma irradiation)

(human iliac crest bone wedge)

(Fig. (acetabular augmentation)

1). 15 30
 30 가 0.9% tri-corticocancellous
 (saline solution) , 가 가 (develop
 opmental) - (neuromuscular)

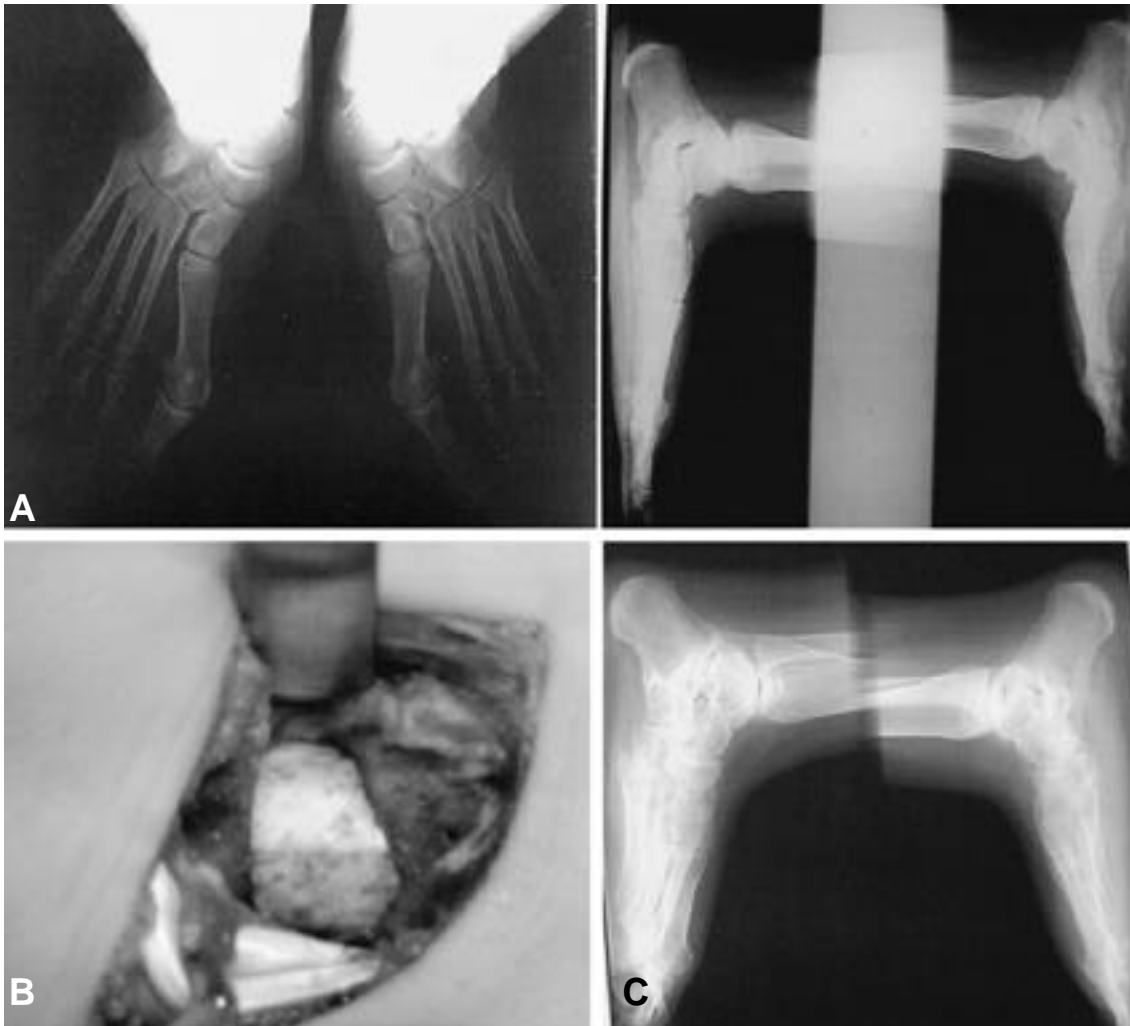


Fig. 3. Painful flatfoot in a 13-year-old girl with spastic diplegia. **A:** Anteroposterior and lateral radiographs showing pathological talonavicular joint subluxation and talar sagging. **B:** Intraoperative photograph showing inserted graft during the procedure of calcaneal neck lengthening osteotomy. **C:** Lateral radiograph showing corrected talar sagging.

(acetabular dysplasia) (innominate osteotomies) (trans-iliac osteotomies) Dega 가 (ilioischial limb) (iliopubic limb)가 (femoral shortening osteotomy) 가 (autoiliac bone) (sciatic notch) (triradiate cartilage) (hinge) (trapezoidal)



Fig. 4. Skew foot deformity in a 9-year-old boy. **A:** Anteroposterior and lateral radiographs showing forefoot adductus and hindfoot valgus. **B:** Anteroposterior radiograph showing inserted graft after opening wedge into the medial cuneiform.



Fig. 5. Painful flatfoot in a 7-year-old boy. Dorsal displacement of the distal calcaneal fragment and calcaneal nonunion with subluxation of the calcaneocuboid joint was observed after calcaneal lengthening osteotomy.

10
 (; Salter
 osteotomy) 가
 6
 (Fig. 2).
 (pathologic flatfeet)
 (calcaneal neck lengthening osteotomy)
 10). (sag
 ging talar head)
 가
 (pes
 equinovalgus)

(subtalar joint)
 (anterior and middle facet)
 (opening
 wedge osteotomy)
 laminar spreader
 (subluxation)
 (talonavicular joint)
 (rotation)
 (medical cortex)
 (talar head) 가
 가
 1 ~ 2 Steinmann
 pin
 2 가 (Fig. 3).
 4 ~ 6 (per-
 oneus brevis)
 가
 (medial cuneiform)
 9)(Fig. 4).
 (tricot
 tical)
 Kirschner wire Steinmann pin
 (Fig. 5),
 가
 (fatigue fracture)

REFERENCES

- 1) Anderson MJ, Keyak JH and Skinner HB: Compressive mechanical properties of human cancellous bone strength measurement. *J Med Eng Technol*, 19:1-5,1998.
- 2) Fideler BM, Vangsnest CT, Moore T, Li Z and Rasheed S: Effect of gamma irradiation on the human immunodeficiency virus: a study in frozen human bone-patellar ligament-bone grafts obtained from infected cadaver. *J Bone Joint Surg*, 76-A:1032-1035, 1994.
- 3) Glancy GL, Brugioni DJ, Eiler RE and Chang FM: Autograft versus allograft for benign lesions in children. *Clin Orthop Rel Res*, 262:28-33, 1991.
- 4) Grudziak JS and Ward WT: Dega osteotomy for the treatment of congenital dysplasia of the hip. *J Bone Joint Surg*, 83-A:845-854, 2001.
- 5) Hamer AJ, Colwell A and Eastell R: Biomechanical and biochemical changes in cortical allograft bone after gamma irradiation. *J Bone Min Res*, 10:339-345, 1995.
- 6) Hamer AJ, Stockley I and Elson RA: Changes in allograft bone irradiated at different temperatures. *J Bone Joint Surg*, 81-B:342-344, 1999.
- 7) Hamer AJ, Stracjan JR and Black MM et al.: Biomechanical properties of cortical allograft bone using a new method of bone strength measurements: a comparison of fresh, fresh-frozen and irradiated bone. *J Bone Joint Surg*, 78-B:363-368, 1996.
- 8) Hiemstra H, Termette M, Vos AH, Van Berkel MP and DeBree HI: Inactivation of human immunodeficiency virus by gamma radiation and its effects on plasma and coagulation factors. *Transfusion*, 31:32-39, 1991.
- 9) McHale KA and Lenhart MK: Treatment of residual clubfoot deformity - the "bean-shaped" foot - by opening wedge medial cuneiform osteotomy and closing wedge cuboid osteotomy. Clinical review and cadaver correlations. *J Pediatr Orthop*, 11:374-382, 1991.

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- 10) Mosca VS: Calcaneal lengthening for valgus deformity of the hindfoot. Results in children who have severe, symptomatic flatfoot and skewfoot. *J Bone Joint Surg*, 77:500-512, 1995.
- 11) Stachowicz W, Ostrowski K, Dziedzic-Goclawska

A and Komender A: On free radicals evoked by radiosterilization in preserved bone grafts. In: sterilization and preservation of biological tissues by ionizing radiation. *Vienna, International Atomic energy Agency*, 15-27, 1970.