Periacetabular Osteotomy
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The differential diagnosis of hip pain in a young adult includes various overuse conditions, traumatic injuries, osteonecrosis, and developmental disorders — most notably hip dysplasia. Bony anatomical abnormalities need early intervention to prevent permanent cartilage damage of the hip. In fact, 25–50% of hip dysplasia patients develop such severe osteoarthritis by the time they are 50 years old that they require total hip arthroplasty. In select cases of hip dysplasia, a periacetabular osteotomy to reorient the joint may decrease symptoms, increase function, and may even prevent or delay arthritis.

The diagnosis of significant hip dysplasia in adults can usually be made on an anterior-to-posterior (AP) radiograph: center edge angle (CEA) < 20°; acetabular index (AI) > 10°; lateralization of the femoral head > 10 mm from the medial acetabular teardrop. Acetabular retroversion can be present in 16–33% of cases. Osteoarthritis in these hips typically starts superior continued on page 2
medially, which can be difficult to
detect on standard AP radiographs.
A functional abduction AP radio-
graph taken in full abduction in the
coronal plane with the lower extrem-
ity internally rotated 15 degrees
better represents the joint after the
reorientation from a periacetabular
osteotomy and may better reveal
such early arthrosis. Furthermore,
a false profile view can reveal lack
of anterior acetabular coverage. The
risk of a total hip arthroplasty for
a hip dysplasia patient is 2.6 times
greater than the normal population.

Case Presentation
A 19-year-old female presented with
a 6 month history of increasing left
hip pain of atraumatic onset.
Conservative treatment by her
orthopedic surgeon had failed and
she was referred for joint preserving
periacetabular osteotomy. AP radio-
graph clearly showed hip dysplasia,
with CEA of 12, AI of 40, and 8 mm
lateralization. Her asymptomatic
contralateral hip had CEA of 33, AI
of 20, and 6 mm of lateralization. She
underwent a Ganz periacetabular
osteotomy, which involves 4 cuts
around the hip joint through an
anterior iliofemoral approach. The
strength of this particular osteotomy
is that the posterior column remains
intact so the reoriented acetabulum
can be stabilized to the intact poste-
rior column with screws. The osteot-
omy improved the left hip’s CEA to
50 degrees, the AI to 11 degrees, and
lateralization to 3 mm. Two years
from the procedure, she is active and
her operated hip does not cause her
pain nor limit her activity.

Spine Advanced Technology Laboratory (SATL)
Explores In-Vivo Tissue Engineering of
Musculoskeletal Tissues
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Using unique combinations of
resorbable natural materials, resorb-
able polymers, mesenchymal stem
cells, growth factors, and nanoparti-
cles, the Spine Advanced Technology
Lab (SATL) of The Methodist Hospi-
tal Research Institute has made sig-
nificant advances in musculoskeletal
tissue engineering. The result has
been the development of composite
materials capable of generating bone
and cartilage as well as other related
(and unrelated) tissues — a versatile
platform for in-vivo tissue engineer-
ing.1 The vision is that someday such
composite materials will be either
surgically implanted or injected into
areas deficient of natural tissues in
humans allowing for rapid in-vivo
regeneration.

Thus far, these materials have been
shown to form bone and cartilage
in rat models and intervertebral
disc tissue in-vitro. Even studies of
regeneration of solid organs, such as
the liver and kidney are underway.
Additionally, the materials have been
used to deliver antibiotics for infec-
tion prevention and chemotherapeu-
tic agents for cancer treatment. Frac-
tures, osteoarthritis, osteoporosis,
bony metastases, and intervertebral
disc degeneration are current targets
for the new technologies; but the list
is expanding.

Figure 1 shows silicon nanoparticles
that are often used in the composite
materials to allow the controlled
delivery of drugs. For instance, by
altering the size of the pores within
the particles and then coating the
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Infected nonunions can be quite challenging, especially following intra-articular fractures. The chances of developing such a condition increase following open fractures, and are complicated at the ankle by the fracture location being subcutaneous. Systemic conditions affecting immunity, such as immunosuppressive medications, diabetes mellitus, and malnutrition, as well as local factors such as peripheral vascular disease are also risk factors.

A highly individualized approach is required for these complex cases, and often a salvage procedure is the best treatment option. A key principle for success is complete debridement of all infected and nonviable soft tissue and bone, along with removal of all infected hardware, and local and systemic antibiotic delivery for several weeks. With the infection eradicated, reconstructive surgery can be performed, usually minimizing or avoiding placing hardware in the previously infected region. This often requires a multistaged approach to first eliminate the pathogens and then encourage bony union.

**Case Presentation**

A 55-year-old male, with noninsulin dependent diabetes mellitus, sustained a grade 2 open trimalleolar ankle fracture treated with irrigation, debridement, and immediate fixation. Both incisions continued to drain despite oral antibiotic therapy, leading to subsequent removal of some of the hardware. However, the wound dimensions and drainage increased despite the patient not having fever, chills, or systemic symptoms. Four months following injury, he was referred for limb salvage.

He presented with thick, purulent drainage from the medial and lateral incisions. The ankle joint was visible through the medial wound with notable loss of tibial and talar articular surfaces. The ankle was grossly unstable with his pain level reported as being 8/10.

The patient underwent removal of all hardware, as well as all nonviable bone and soft tissue, along with irrigation of the ankle joint, placement of antibiotic impregnated polymethylmethacrylate beads, and application of a spanning medial external fixator. Operative cultures grew methicillin resistant staphylococcus aureus. Two further debridements were performed with continued on page 4
Infected Nonunion Following Ankle Fracture

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Figure 2: AP radiograph of right ankle following debridement, placement of antibiotic beads and a spanning external fixator. Figure 3a and 3b: AP (a) and lateral (b) radiographs of right tibia showing solid ankle fusion in good alignment.

exchange of the antibiotic beads at 72 hour intervals. Subsequently, a multiplanar external fixator was applied to fuse the ankle joint and simultaneously begin distraction osteogenesis to regain lost tibial length. The medial and lateral wounds healed uneventfully over the ensuing 2 weeks. Culture specific parenteral antibiotics were administered for a total of 6 weeks.

The fixator was removed 9 months postoperatively, by which time there was a solid arthrodesis, restoration of limb length, and no evidence of infection, allowing him to return to active employment as an engineer technician.