ACETABULAR RECONSTRUCTION WITH METALLIC REINFORCEMENT DEVICE AND HYDROXYAPATITE

Midterm Results

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Purpose

We are using Kerboull-type acetabular reinforcement devices after packing hydroxyapatite granules into acetabular bone defects in revision THA.

We report our 3-9 year clinical and roentgenographical results.
PATIENTS

25 hips (21 women, 4 men)

Average age at operation 67.1 y.o. (46-81)

Follow-up period 5 yr. 10 mo. (3-9 y)

Initial diagnosis

- Hip dysplasia and DDH 18
- RA 3
- Femoral neck fracture 3
- Avascular necrosis 1
## PATIENTS

<table>
<thead>
<tr>
<th>Previous Operations</th>
<th>THA</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bipolar HA</td>
<td>5</td>
</tr>
<tr>
<td>Acetabular bone defects</td>
<td>Type II</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Type III</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Type IV</td>
<td>1</td>
</tr>
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Reconstructive Procedure

Lateral approach
  Transtrochanteric  15
  Transgluteal  10

Filling materials
  Hydroxyapatite  25
  Autografts (wall reconstr.)  7

Reinforcement device (Plate)
  Kerboull  14
  KT  11

THA device
  Charnley  1
  Kyocera PHS  22
  CMK  2
Main Strategy

Removal of the acetabular component and fibrous tissue

Wall defects (-) or
Small wall defects

Packing of HA granules with/without HA blocks

Major wall defects

Wall reconstruction with Autografts (iliac, fibular)

Packing of HA granules

Plate Fixation

Cementing of a polyethylene cup
Hydroxyapatite

\[ \text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2 \]

Porosity: 35-48%

Sintered at 1150 degrees

Compressive Strength

35 MPa

Bending strength

130-200 kg/cm\(^2\)

Granules

G4: 0.9-1.5 mm

G6: 3.0-5.0 mm

Grains

S1: 15*18*12

S2: 18*30*12

Blocks

S1: 15*18*12

S2: 18*30*12
Kerboull Cross Plate
KT Plate
Packing oh HA granules
Wall Reconstruction with Autografts

Fibula
Iliac span
Clinical and Radiological Evaluation

Japanese Orthopaedic Association (JOA) Hip Score System
Pain, ROM, Walking ability, ADL

Radiolucency
DeLee – Charnley

Migration
> 3mm
> 3 degrees
RESULTS

Re-revision 0

Complications
  Dislocation 2
  Trochanteric nonunion 2
  Infection 0
  Nerve palsy 0
## JOA Hip Score

<table>
<thead>
<tr>
<th></th>
<th>Preop</th>
<th>Last FU</th>
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<tbody>
<tr>
<td>Pain</td>
<td>16.9</td>
<td>38.2</td>
</tr>
<tr>
<td>ROM</td>
<td>12.1</td>
<td>16.3</td>
</tr>
<tr>
<td>Walk</td>
<td>5.4</td>
<td>10.0</td>
</tr>
<tr>
<td>ADL</td>
<td>8.3</td>
<td>12.2</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>42.9</strong></td>
<td><strong>76.7</strong></td>
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Radiographic Evaluation

Migration 1
(Pelvic Discontinuity case)

Radiolucency
Cement-HA 0
HA-Host bone 0

Breakage of devices 0
Case A.T.
60 y.o. F.
Pre-op
JOA score
50 points

7mo

1d

8yr

89 pts
Case A.T.

CT Scan Image

Right hip
7 yr 6 mo

Left hip
6 yr 6 mo
Case S.K.
72 y.o. F
Pre-op
JOA Score
49 points

1mo
5mo
9yr 3mo
JOA Score
74 points
Case S.K.

Bone Scintigram : 2yr post-op
Case S.K.

CT Scan Image

8yr 5mo
Post-op
Case T.H.

77 y.o. F

Pre-op

JOA Score 44 points

3yr

1mo

JOA Score 96 points

8yr 4mo
Case T.H.
Case T.H.

CT Scan Image  7yr 9mo post-op
Case T.H.  Bone Scintigrams

1yr post-op

2yr post-op

Pre-op 7 yr 10 mo  86 points
Case H.K.    Med. Wall recon. + HA

Pre

1 mo

7 mo

6 yr
Case H.Y.

75 y.o. F

Pre-op

JOA Score
43 points

1 mo

8 mo

6 yr

JOA Score
69 points
Is medial wall reconstruction with HA plate possible?
Case  I.T. : RA patient  Pelvic Discontinuity IV
The medial wall reconstructed with HA-TCP Plate

66 y.o. F
Pre-op AP
JOA Score
40 points

3mo.

Pre-op Lat

3yr.
JOA Score
68 points
Case  I.T. : RA patient  Pelvic Discontinuity IV
The medial wall reconstructed with HA-TCP Plate

3mo.

3yr.
Is the Kerboull-type plate is necessary?
Case Y.T.
45 y.o. F
Without Plate

Pre-op
Plate should be used!!

2 w
3 yr

5 yr 6 mo
Hydroxyapatite

Bone conductivity
direct bonding
Mechanical property
strength, various porosity,
non-resorbability
Form  granules, block, plate
of various size
HA granules were packed into massive bone defects without additional grafts or cup support in 40 hips.

Direct bonding of HA to bone were observed radiologically without morphological changes, except in the 3 joints with migration.
Acetabular Graft Materials

Autografts
  Quantity and quality
  Harvest site pain

Allografts
  Bone bank
  Disease Transmission

Artificial Bone
  Hydroxyapatite (HA)
  Apatite-Walastnite Glass Ceramic (AWGC)
AW-Glass Ceramic

Cao-P2O5-Mgo-SiO2

Porosity: 70 %
Compressive Strength
20MPa
Case  K.A.  THA Infection
Wall Reonst + AWGC

1998 01
1998 07
2002 10
4 yr. po
Case T.K.

89 y.o. F
Pre-op

JOA Score
40 points

1 mo

5 mo

JOA Score
68 points

3 yr
Conclusions

Acetabular reconstruction with Kerboull-type reinforcement device and hydroxyapatite granules provided excellent results at 3-to 9-year follow-up (average 5 years and 10 months). Reconstruction of large segmental defects with autografts seemed effective. Medial wall reconstruction with HA-TCP plate seems to be encouraging.