Anatomic cementless total hip arthroplasty with ceramic bearings and modular necks: 3 to 5 years follow-up

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ABSTRACT: The authors reviewed 216 anatomic cementless hip arthroplasties with ceramic bearings and modular necks, followed up for a minimum of 3 years (range 3-5 years), consecutively implanted in 208 patients between June 1995 and December 1997. The titanium femoral component, proximally hydroxyapatite coated, has 5 different types of prosthetic neck each available in 2 different lengths and is usually articulated with a ceramic on ceramic coupling with a hydroxyapatite coated hemispheric cup. The Mèrle d’Aubigné-Charnley hip score and the Gruen radiographic analysis were used for the clinical and radiological evaluation. Apart from one revision of both cup and stem for a loose implant after 2 years, no osteolysis was noted in the periprosthetic bone, where 99.4% of the prostheses showed good osseointegration. The survival analysis predicted 98.6% good results at 5 years, where survival analysis was performed for all the parts of the prosthesis. The advantage of this prosthesis is the possibility of adaptation to different diaphyseal and extradiaphyseal anatomical conditions. With regard to the neck modularity, for primary arthritis a straight neck was chosen for 81% of the cases, for congenital dysplasia of the hip, a neck with a retroversion of 8° or 15° was used in 34% and a straight neck in 59% of the cases.

KEY WORDS: Total hip arthroplasty, Ceramic-ceramic coupling, Modular neck
THA with modular neck and ceramic bearing

MATERIALS AND METHODS

The prosthesis used in this study (Fig. 1) (AnCA Fit, Cremascoli Ortho, Italy) was developed following the previous experience with the anatomical prosthesis AnCA (7), and the prosthesis GSP (8). The titanium alloy stem (Ti6Al4V) is anatomically shaped, with the proximal third coated with 80µ high crystalline plasma sprayed HA (9) (Ca/P rate of 1.67±0.05; purity >97% (10); crystallinity >60% (11)).

The stem has 8 different sizes, ranging from 9.5 mm to 17.5 mm. The shape of the stem was optimised by computer analysis in order to obtain the appropriate dimensional features in both the proximal and distal parts of the stem. This involved minimising the risk of fractures of the femoral metaphysis, but being able to guarantee an optimal torsional stability, as tested by experimental analysis (12).

The stem has a minimal length of 119.5 mm in the 9.5 size, a maximal length of 138.5 mm in the 17.5 size, and was tapered in the distal part and at the tip so to avoid contact between the latter and the cortical bone, thus reducing thigh pain.

The modular titanium neck is inserted in the stem by a double tapered coupling. There are 2 lengths of modular neck: short (28 mm) and long (38.5 mm). For both types there are 5 different models (Fig. 2): straight, varus-valgus of 8°, lateral-medial, anteversion-retroversion of 8° or 15°, thereby offering a wide number of choices during the surgery.
The 28 millimetre ceramic head (Biolox® Forte, Ceramtec, Stuttgart, Germany), fitted to the modular neck by a tapered coupling, is available in three sizes: short (-3.5 mm), medium (0 mm) and long (+3.5 mm). A metallic head (22 mm or 28 mm) is also available in the same three sizes.

The different couplings between the 2 neck lengths and the 3 head lengths enable a good modulation of the system length: indeed the latter can vary between 24.5 mm (28 mm - 3.5 mm) and 42 mm (38.5 mm + 3.5 mm).

The tapered neck has a spiral ruled surface with a high precision fit to the ceramic ball head. This guarantees a continuous contact of the metal and ceramic coupling lowering the hazard of ceramic fracture.

The hemispheric titanium socket, coated with two layers of titanium beads and hydroxyapatite, is press-fitted into the acetabulum. Two pins on the socket provide additional primary torsional stability, facilitating the achievement of osseointegration and secondary stability (13).

The socket comes in 13 sizes (ranging from a diameter of 42 mm to 66 mm) and 2 shapes, one without holes and one with 5 holes in the supero-external pole for titanium screws in case of suboptimal press-fit.

The internal part of the acetabular socket consists of a truncated tapered cone for coupling with the ceramic liner (Biolox® Forte, Ceramtec, Stuttgart, Germany), except for the smaller sizes (42 and 44 mm), in which the couple is between an ultra high molecular weight polyethylene (UHMWPE) liner and a metallic head of 22 mm. UHMWPE liners, with an anti-dislocation rim, may also be used in the other sizes. Tests tools are provided with the ancillary equipment not only for the cup and the stem, but also for the necks and the heads. Therefore, it is possible to trial at surgery the solution with the best stability and restore the anatomy.

**MATERIALS**

Between June 1995 and December 1997, 216 hip prostheses were implanted in our department. A ceramic-ceramic coupling was used for all cases.

Figure 3 summarises the THR: 11 (5%) are revisions for aseptic loosening and 205 (95%) are primary implants.

There were 208 patients (8 bilateral implants, 2 females and 6 males) with an average age of 55 years (range, 16-81 years), 106 (51%) were female and the right side was operated in 50.5% of the cases.

Figures 4 and 5 report measures of the indication for implanted stems and cups respectively. The components chosen for the revision cases are bigger, where all the acetabular cups are ≥ 54mm.
THA with modular neck and ceramic bearing

Fig. 4 - Distribution of the stem sizes used for primary or revision surgery.

Fig. 5 - Distribution of the cup sizes used for primary or revision surgery.
In 186 cases (86.1%) the cup implanted was without holes (89.2% of the primary THR and 27.3% of the revisions). Only 30 of the implanted cups had screw holes: 19 of them needed screws to improve primary stability (11 of the THR, 5.4%, and 8 of the revisions, 72.7%), while 11 obtained good stability with the simple press fit and did not require screws (all primary implants, 5.4%).

The features of the length and the shape of the prosthesis neck are summarized in Figure 6.

Of the short and long modular necks available, the former has been chosen in 44% of the cases: in the revision group only 9.1% of the prostheses had a short neck, whereas the difference was low among primary implants (45.9% versus 54.1%, respectively).

The most frequently used neck is the straight one (80.5%), followed by the others: 8° retroversion (11.1%); varus (2.8%); 15° retroversion (2.3%); 8° anteversion and valgus (0.9%); lateralized, medialized and 15° anteversion (0.5%). A non-straight neck was more frequently used for revision cases (27.1% vs 19%).

Table I describes the head and neck couplings, whereas Table II shows the linkage between the chosen neck and the different etiology. The straight neck was used
in 87.6% of the primary arthritis cases and only in 59% of the dysplastic hips; in the latter case the retroversion one was more frequently used (34.1 % vs. 6.2%, respectively).

Among the 208 patients, one died as a result of cardiovascular collapse five days after surgery, 4 died within 3 years with no relationship to the THR, 1 patient underwent a total hip revision of the implanted prosthesis, and 27 patients were lost to follow up. There was a 3 year minimum follow up for 183 implants (mean 44 ± 6.2 months, max 67 months).

METHODS

For all patients a clinical and radiographic evaluation was performed at follow-up following the Mèrle d’Aubignè (14) and Gruen (15) criteria, respectively. The occurrence of stress shielding or hypertrophy of the femoral cortex was also evaluated (as described by authors) (7). For 33 implants, the follow-up was shorter than 36 months: but they were evaluated for surgical and early complications.

The revised necks were analysed by electron microscopy and compared with the results obtained from wear simulator testing (16).

A survival analysis was performed using actuarial methods (17) and carried on until 30 cases were under observation (in order to present stable statistical indications). The surgical revision of the implant is the negative event, the follow-up results from the interval between surgery and the last control.

RESULTS

Clinical results

At clinical evaluation, all patients after surgery (primary as well as revision) obtained a significant improvement in pain, range of motion and deambulation points (Fig.7).

TABLE I - HEAD-NECK COUPLINGS USED AND PLAN FOR POSSIBLE COUPLINGS

<table>
<thead>
<tr>
<th>Neck/Head</th>
<th>Length head and neck</th>
<th>Overall (%)</th>
<th>Primary (%)</th>
<th>Revision (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short/short</td>
<td>24.5mm</td>
<td>47 (21.7%)</td>
<td>47 (22.9%)</td>
<td>-</td>
</tr>
<tr>
<td>Short/medium</td>
<td>28 mm</td>
<td>39 (18%)</td>
<td>38 (18.5%)</td>
<td>1 (9.1%)</td>
</tr>
<tr>
<td>Short/long</td>
<td>31.5 mm</td>
<td>9 (4.2%)</td>
<td>9 (4.4%)</td>
<td>-</td>
</tr>
<tr>
<td>Long/short</td>
<td>35 mm</td>
<td>55 (25.5%)</td>
<td>52 (25.4%)</td>
<td>3 (27.3%)</td>
</tr>
<tr>
<td>Long/medium</td>
<td>38.5 mm</td>
<td>41 (19%)</td>
<td>39 (19%)</td>
<td>2 (18.2%)</td>
</tr>
<tr>
<td>Long/long</td>
<td>42 mm</td>
<td>25 (11.6%)</td>
<td>20 (9.8%)</td>
<td>5 (45.4%)</td>
</tr>
<tr>
<td>Total cases</td>
<td>216</td>
<td>205</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>
Leg length discrepancy after the implant decreased from 67.6 to 22.7% (11.1% remaining with a mean lengthening of 1.5 cm and 11.6% with a mean shortening of 1.3 cm).

Radiographic results

At follow-up of the primary implants 98.8% of the stems (172 of the 174 implants) and 99.4% of the acetabular cups (172 of the 173, one had been revised) had bony stability (Fig.8), one stem had a fibrous stability (0.6%), one stem (0.6%) and one cup (0.6%) were unstable. All cups used for revisions had bony stability whereas 33.3% of the stems used for revisions showed a fibrous stability. No calcar resorption was noted in 76.5% of the stems, with little resorption in the remaining cases. In 51 cases (29.3%), a cancellous remodelling of the cortical bone was observed in at least one of the seven Gruen Regions of Interest (ROI) (Tab. IIIa); in one case the bone resorption involves, besides area 2 and 6, also area 1.

In 73 cases (42%) there was hypertrophy of the cortex, of less than 50% of the original thickness (Tab. IIIb); an hypertrophy greater than 50% was present in 4 cases.

Among the revisions, 8 cases (88.8%) presented a cancellous bone remodelling in one area, and 3 cases (33.3%) a low grade hypertrophy. There were no cases with high grade hypertrophy (Tab. IVa-b).

### TABLE II - USED NECKS SUBDIVIDED BY PREOPERATIVE DIAGNOSIS

<table>
<thead>
<tr>
<th>Aetiology</th>
<th>Cases</th>
<th>Straight</th>
<th>Retro 8°</th>
<th>Retro 15°</th>
<th>Anti 8°</th>
<th>Anti 15°</th>
<th>Varus</th>
<th>Valgus</th>
<th>Later</th>
<th>Medial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoarthrosis</td>
<td>113</td>
<td>99</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>CDH</td>
<td>44</td>
<td>26</td>
<td>13</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Post-traumatic arthritis</td>
<td>15</td>
<td>13</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Avascular necrosis</td>
<td>12</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Secondary arthritis</td>
<td>9</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rheumatic disease</td>
<td>5</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Post-septic arthritis</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Post-traumatic necrosis</td>
<td>5</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Aseptic loosening</td>
<td>11</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total cases</td>
<td>216</td>
<td>174</td>
<td>24</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Overall %</td>
<td>(80.5%)</td>
<td>(11.1%)</td>
<td>(2.3%)</td>
<td>(0.9%)</td>
<td>(0.5%)</td>
<td>(2.8%)</td>
<td>(0.9%)</td>
<td>(0.5%)</td>
<td>(0.5%)</td>
<td>(0.5%)</td>
</tr>
</tbody>
</table>
Survival analysis and description of the revised case

A survival analysis was carried out for the implants and for the single prosthetic components. At 5 years after surgery, 98.6% of the implants were not revised (Fig. 9a). Studying each component at 5 years we find 99% of the acetabular cups stable (Fig. 9b), 99.5% of the stems (Fig. 9c), 98.6% of the heads and the necks (Fig. 9d).

One patient (31 year old male, post-traumatic arthropis) underwent a total hip revision because of subsidence of the prosthetic stem implanted 2 years and 9 months before (Fig.10). Trochanteric and thigh pain was referred one year after the THR, which required the patient to use a walking stick, with a still good range of motion. The radiographs showed 8 mm of subsidence and varus deviation of the prosthetic stem (there was a radiolucency of less than 2mm in Gruen zones 5, 6 and 7, a cancellous bone in zones 1 and 7, and resorption of the calcar), the stem was unstable. CT scan, Tc99m scintigraphy and a labelled granulocyte scintigraphy confirmed the loosening of both components of the prosthesis. The patient refused the revision surgery. One year after the patient was admitted to our hospital, because of the increasing pain, the stem had a further subsidence of 5mm (total subsidence 13mm). The imaging and the laboratory examinations again confirmed the loosening of both the cup and the stem. At revision surgery the stem was removed easily, whereas the cup was found to be well integrated and stable. A fibrous membrane encapsulating the stem was removed.

General complications

Three general complications occurred (0.9%): a cardiovascular collapse with the death of the patient at 5 days post surgery; an intraoperative hypertensive crisis evolved into hemiparesis; an acute pulmonary edema, which was resolved by medical therapy.

Local complications

There were 6 cases (2.7%) of prosthetic dislocation. Four of them healed after reduction and immobilization for 30 days: 2 occurred at 5 and 13
days after surgery; 2 affected the same patient, the right and the left hip at 107 days and 2 years and 8 months after surgery, respectively.

Other 2 cases with recurrent dislocations required surgical treatment. The first case was revised after 45 days and a long straight neck was replaced by a long, 15° retroversion neck (where the same head length was used) (Fig. 11). The last case required a revision of the acetabular cup after 20 months; a cup stabilized by screws was implanted choosing a long straight neck, with a long head (instead of the short neck and medium head utilized during the primary implant) in order to improve the previous shortening of 13mm.

There were no clinical complications related to the modular necks.

The explanted necks show a burnished area on the surface of neck-stem coupling (in the proximal-medial region and in the distal-lateral region) similar to the results for prosthetic necks tested using a simulator, without any corrosion signs (18).

Fig. 8 - Female, 60 years old, with primary arthritis of the right hip A) pre-op radiograph B) post-op radiograph: a long valgus neck was used. C-D) 4.5 years follow up: the prosthesis had bony stability.
THA with modular neck and ceramic bearing

**DISCUSSION**

The extremely variable anatomical conditions of patients have induced the development of custom-made and modular implants.

Custom-made prostheses can be produced in the course of surgery (19): making the operation longer and the costs higher. The prosthesis can also be manufactured before surgery, using 3D CT imaging (20-24), where the operation is deferred in order to construct the prosthesis and the rasps.

In both cases, “custom-made” prostheses cannot answer the technical safety requirements and standard product controls through careful and prolonged mechanical tests, which guarantee their strength according to ISO standard (7206).

Furthermore, there is no evidence in the literature that custom-made implants significantly improve clinical results or implant survival (25). Finally the high costs reduce the use of these prostheses to those few cases where the femoral anatomy prevents the use of standard prostheses (24, 26).

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**TABLE III** - RADIOGRAPHIC ANALYSIS RESULTS OF THE CORTICAL BONE, USING GRUEN’S EVALUATION FOR PRIMARY SURGERY

| a) Bone resorption in primary implants (51 cases) |
| --- | --- | --- | --- | --- |
| N° of zones | cases | 1 zones 1 and 7§ | 1 zones 2 and 6* | 1 zones 1 and 2 |
| 1 | all in zone 1 | 32 zones 1 and 7§ | 3 zones 1, 2, 7 | 3 zones 1, 6, 7 |
| 2 | 35 | 7 | 1 zones 1, 2, 3 |
| 3 | 1 | zones 1, 5, 6, 7* |
| 4 | |

*with cortical thinning zone 1
*with cortical bone resorption in zone 4
§ in 1 case with cortical bone resorption in zone 4

| b) Cortical thickening more than 50% in primary implants (73 cases) |
| --- | --- | --- | --- | --- |
| N° of zones | cases | 7 zones 5 | 3 zones 6 | 2 zones 7 |
| 1 | 13 zones 3 | 7 zones 5 and 6 | 5 zones 2 and 3 | 2 zones 2, 6* |
| 2 | 17 zones 3 and 5 | 4 zones 2, 3, 5 | 1 zones 2, 3, 5 | 1 zones 2, 3, 6* |
| 3 | 7 zones 3, 5, 6 | |
| 4 | All in zones 2, 3, 5, 6 | |

| with hypertrophy greater than 50% in zones 3 and 5 |
| with hypertrophy greater than 50% in zone 5 |

**TABLE IV** - RADIOGRAPHIC ANALYSIS RESULTS OF THE CORTICAL BONE, USING GRUEN’S EVALUATION FOR REVISION SURGERY

| a) Bone resorption in revision surgery (8) |
| --- | --- | --- |
| N° of zones | cases | zone 7 | zones 1 and 7* |
| 1 | 1 | |
| 2 | 5 | All in zones 1, 2, 6, 7 |
| 4 | 2 |

* 1 case with cortical thinning zone 2

| b) Cortical thickening less than 50% in revision surgery (3 cases) |
| --- | --- | --- |
| N° of zones | cases | 1 zone 5 | 1 zone 6 |
| 1 | 2 | |
| 2 | 1 | zones 3 and 5 |
Table 1: Results of the AnCA Fit prostheses.

<table>
<thead>
<tr>
<th>Years</th>
<th>% good result</th>
<th>i.c. 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>99.54</td>
<td>98.64</td>
</tr>
<tr>
<td>2</td>
<td>99.07</td>
<td>97.80</td>
</tr>
<tr>
<td>3</td>
<td>98.61</td>
<td>97.04</td>
</tr>
<tr>
<td>4</td>
<td>98.61</td>
<td>97.04</td>
</tr>
<tr>
<td>5</td>
<td>98.61</td>
<td>97.04</td>
</tr>
</tbody>
</table>

Fig. 9a - Survival analysis of the AnCA Fit prostheses.

Table 2: Results of the AnCA Fit cups.

<table>
<thead>
<tr>
<th>Years</th>
<th>% good result</th>
<th>i.c. 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>99.54</td>
<td>98.64</td>
</tr>
<tr>
<td>2</td>
<td>99.07</td>
<td>97.80</td>
</tr>
<tr>
<td>3</td>
<td>99.07</td>
<td>97.80</td>
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<tr>
<td>4</td>
<td>99.07</td>
<td>97.80</td>
</tr>
<tr>
<td>5</td>
<td>99.07</td>
<td>97.80</td>
</tr>
</tbody>
</table>

Fig. 9b - Survival analysis of the AnCA Fit cups.

Table 3: Results of the AnCA Fit stems.

<table>
<thead>
<tr>
<th>Years</th>
<th>% good result</th>
<th>i.c. 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>2</td>
<td>99.54</td>
<td>98.64</td>
</tr>
<tr>
<td>3</td>
<td>99.54</td>
<td>98.64</td>
</tr>
<tr>
<td>4</td>
<td>99.54</td>
<td>98.64</td>
</tr>
<tr>
<td>5</td>
<td>99.54</td>
<td>98.64</td>
</tr>
</tbody>
</table>

Fig. 9c - Survival analysis of the AnCA Fit stems.

Table 4: Results of the AnCA Fit heads and modular necks.

<table>
<thead>
<tr>
<th>Years</th>
<th>% good result</th>
<th>i.c. 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>99.54</td>
<td>98.64</td>
</tr>
<tr>
<td>2</td>
<td>99.07</td>
<td>97.80</td>
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<tr>
<td>3</td>
<td>99.07</td>
<td>97.80</td>
</tr>
<tr>
<td>4</td>
<td>99.07</td>
<td>97.80</td>
</tr>
<tr>
<td>5</td>
<td>99.07</td>
<td>97.80</td>
</tr>
</tbody>
</table>

Fig. 9d - Survival analysis of the AnCA Fit heads and modular necks.
Modular prostheses have been described as a means of increasing the torsional stability of the implant. Beside models that couple a metaphyseal and a cylindrical diaphyseal component (to achieve a good ‘fit and fill’) (27-30) there are others that use heads of different lengths and diameters (24, 31-34).

The prosthesis described in the present paper is anatomically shaped in order to optimize the filling of the femoral canal; the modularity of interchangeable necks allows AnCA Fit prosthesis to restore the biomechanics of the hip.

Modular prostheses allow the surgeon to correct the length of the lower limb, the offset, and the ante- retroversion of neck, to avoid long waiting times and expense of custom-made prostheses, and to guarantee the reliability of mechanical tests (done on standard prostheses). Such modularity is particularly useful in cases where the femoral deformity is complex, as in congenital dysplasia and post-traumatic arthritis (24).

A link between the chosen neck and the different aetiology of hip arthrosis is present in our cases (Tab. II):

Fig. 10 - Male, 31 years old, with post-traumatic arthritis of the left hip A) pre-op radiograph B) post-op radiograph, C-D) 2 year and 9 month follow-up: the prosthesis has subsided 13 mm.
Fig. 11 - Male, 67 years old, with primary arthritis of the right hip A) pre-op radiograph B) post-op radiograph; C) recurring dislocations D-E) after revision: the long straight neck was replaced with a long 15° retroversion neck.
the straight neck is only used in 59% of dysplastic hips, where the retroversion one was implanted in 34.1% of these cases.

In addition the modular prosthesis allows the surgeon to replace just some components of the implant (24, 33) in reoperation cases, as performed in the two described cases of dislocation.

In spite of these advantages, a modular prosthesis has some problems related to the risk of corrosion between coupled component of different metals, fretting (1, 4, 31, 32, 35-40), dislocation of components (41-43), fracture under the head or in the conical segment of the neck (37). In this follow-up there were no cases of fracture or disassembly of components.

The potential problem of corrosion and fretting is already present when there is only one surface area of contact (head-neck), and thus in the described prosthesis, where there is a further assembly between the neck and the stem, the problem could be worse. Nevertheless laboratory results, using extreme tests with such materials, have shown that the coupling between the modular neck and the stem have such features as to guarantee their structural safety together with a lack of micromovement and consequently provide remarkable clinical corrosion-wear resistance between the adjacent metallic surfaces (2, 44, 45).

The comparative analysis between retrieved necks and those experimentally studied confirmed the absence of corrosion (8). Such results were obtained

Fig. 12 - Explanted neck: the burnished areas of the coupling surface with the stem are evident as indicated by the arrows in the proximal medial and distal lateral areas.
through the corrosion resistant features of the titanium alloy and the peculiar geometry of the coupling (oblong section and conical shape).

The use of a modular prosthesis should be reserved for difficult cases of primary implantation or revision surgery, where the non-modular prostheses are not satisfactory (24, 26). However, in surgical practice, it is very difficult to predict which cases require a modular neck different from the standard. The modularity of the neck, combined with that of the head, gives a greater chance for the correction of leg length discrepancy, which is sometimes a very important problem for the patient (46).

As for reported case of revision of the prosthesis, it is important to underline the discrepancy between the acetabular bone scan uptake (which induced the cup revision) and cup bone ingrowth found at surgery.

In all reviewed cases, no failures were related to the modularity, which facilitated the restoration of a normal anatomical joint, and reduced the complications of dislocation (2.7%). Amstutz (47) reported incidences of variable dislocation, between 0.3% and 8%, with similar results to those reported by Petty (48) and by Eftekar (49). Woolson et al (50) reported 4% of dislocation during the first 3 months of primary implant and Delaunay et al (51) reported 4.6%.

In our experience, the ceramic-on-ceramic coupling of the AnCA Fit removed the problem of polyethylene wear (52), and reduced the risk of osteolysis caused by debris. Histological tests of peri-prosthetic tissues have demonstrated it to be almost lacking in debris (53).

The high mechanical strength of the ceramic heads used (Biolox® Forte, Ceramtec, Stuttgart, Germany) has almost eliminated the risk of head breakage, a frequent occurrence for ceramics used in the 70’s (54-56). There were no cases of head fracture in this follow-up.

Further to the promising experimental and preliminary clinical results achieved with the modular AnCA Fit prostheses, the authors stress the importance of confirming these results for modular prostheses with further follow-ups.

ACKNOWLEDGEMENTS

The Authors wish to thank Barbara Bordini for the statistical contribution and Luigi Lena for the illustrations.

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