Survey of the Outcome of Femoral Head Prosthesis Replacement of Unipolar Type for Intracapsular Femoral Neck Fracture in Elderly Patients

by
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Introduction

Femoral head prosthetic replacement is being widely employed in the treatment of intracapsular femoral neck fracture in elderly patients because it enables them to begin rehabilitation early. The frequency of use of the bipolar type is currently higher than that of the unipolar type. However, there have been some reports on adequate results of treatment with the unipolar type prosthesis in elderly patients. The postoperative results of unipolar type prosthetic replacement were investigated in elderly patients (aged 65 years or older) with intracapsular femoral neck fracture in our hospital, and are reported with discussion of the literature.

Subjects and Methods

We examined 44 joints of 44 patients aged 65 years or older, who had undergone femoral head prosthetic replacement with a unipolar type prosthesis in our department between October 1981 and December 1990.

The patients consisted of 8 males and 36 females. Thus, the ratio of female to male patients was high. The age at surgery ranged from 65 years to 92 years (mean, 77.4 years).

The J-2 unipolar type prosthesis was used in 20, and the Austin-Moore type in 24 patients.

Survival after discharge was followed up by phone in these patients. Twenty patients survived, and 22 patients died. Two patients were lost to follow-up.

The following points were surveyed:
1. Clinical results: Clinical results were evaluated according to the classification of locomotor
activities (Table 1) established by our department and the criteria for the results of treatment of coxarthrosis established by the Japanese Association of Orthopaedic surgery (JOA score). In the 17 surviving patients and 7 patients who eventually died, the course was followed up for 7.1 years on averaged (3–10 years) after surgery.

2. Evaluation of roentgenograms: The patients (15 surviving patients and 6 patients who died) in whom roentgenograms were taken at least 3 years after surgery were examined for the following items: (1) migration of implant, (2) osteosclerosis in the bone marrow around the stem and tip, (3) extension of the clear zone around the stem, and (4) heterotopic ossification.

3. Postoperative survival period: The 42 surviving patients, excluding the 2 patients lost to follow-up, were examined for the postoperative course, and the patients who died were investigated for the postoperative survival period. The number of surviving patients and the number of deaths were also investigated according to the age at surgery.

Cause of death was also investigated to determine its correlation with preoperative complications and survival period according to age.

Results

1. Evaluation of clinical results
   (1) Changes in locomotor activities
   According to the classification of locomotor activities, Class I and II locomotion was possible in all 24 patients before injury. At discharge after femoral head prosthetic replacement, locomotion was possible in 22 (92%) of the 24 patients. At the time of the survey, locomotion was possible in 22 (92%) of the 24 patients. There were 2 patients in Class III, i.e., requiring the use of a wheelchair, at both of discharge and the time of the survey.

   One of the 2 patients in Class III at the time of discharge had had cervical myelopathy as a preoperative complication, and the other had been transferred soon after surgery. When the present survey was conducted, the former patient was still unable to walk, but independent locomotion became possible in the latter.

   Another patient in Class I at discharge was found to be in Class III, at the time of the survey. The onset of cerebral infarction after discharge was the reason for this setback (Fig. 1).

   (2) Changes in JOA score
   The total number of points on the JOA score averaged 74.1 at discharge, and improved to 80.5 at the time of the final ambulatory examination. This score was almost satisfactory.

   Among the items evaluated, the mean score for locomotor ability, 9.8, improved to 13.2, and that for activities of daily living, 8.9, improved to 13.8. The mean score for pain, 37.9, and that for mobility, 17.5, which were determined at discharge, were almost unchanged at the time of the final ambulatory examination (Fig. 2).

   The JOA score at the time of the final ambulatory examination was compared among age groups (divided into 5-year intervals, starting from 65 years). The total score tended to decrease with aging, and that in very elderly patients aged above 80 years was less than the mean score for all patients (Fig. 3).

2. Roentgenographic evaluation
   (1) No central migration of implants was observed on and of the roentgenograms obtained from 21 patients, but sinking was observed in 8 patients (38%), and was 18 mm at maximum. Varus of the stem was observed in 7 (33%) of the 21 patients, but none had valgus of the stem.
Table 1 Classification of locomotor activities

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Able to walk over 500m distance</td>
</tr>
<tr>
<td></td>
<td>(a cane can be used)</td>
</tr>
<tr>
<td>II</td>
<td>Able to walk outdoors and indoors</td>
</tr>
<tr>
<td>III</td>
<td>Disable to walk or the use of a wheelchair</td>
</tr>
<tr>
<td>IV</td>
<td>Confined to bed</td>
</tr>
</tbody>
</table>

Fig. 1 Number of patients by classification of locomotor activities

Fig. 2 Comparison of mean JOA score on discharge and at the time of final ambulatory examination \((n=24)\)

Fig. 3 Comparison of JOA score at the time of final ambulatory examination according to age

Table 2 Roentgenographic evaluation and JOA score \((n=21)\)

<table>
<thead>
<tr>
<th>Roentgenographic evaluation</th>
<th>JOA score (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migration of implant</td>
<td></td>
</tr>
<tr>
<td>i  Central migration</td>
<td>none ((0%))</td>
</tr>
<tr>
<td>ii  Sinking</td>
<td>8 patients ((38%)) 90.9</td>
</tr>
<tr>
<td>iii  Varus of the stem</td>
<td>7 patients ((33%)) 79.6</td>
</tr>
<tr>
<td>Osteosclerosis in the femoral bone marrow cavity</td>
<td></td>
</tr>
<tr>
<td>i  Osteosclerosis around the stem</td>
<td>19 patients ((90%)) 87.5</td>
</tr>
<tr>
<td>ii  Osteosclerosis at the tip end of the stem ((hook image))</td>
<td>20 patients ((95%)) 87.5</td>
</tr>
<tr>
<td>Extension of a clear zone around the stem in the femoral bone marrow cavity</td>
<td>1 patient ((5%)) 89.0</td>
</tr>
<tr>
<td>4 Heterotopic ossification</td>
<td>5 patients ((24%)) 82.0</td>
</tr>
</tbody>
</table>
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Fig. 4 Comparison of the number of surviving patients and deaths according to age at surgery (n=42)

Fig. 5 Survival period in the patients who died according to age

* Indicates the patients in whom the causes of deaths were clearly correlated with preoperative complications

Table 3 Causes of Deaths (n=22)

<table>
<thead>
<tr>
<th>Cause</th>
<th>N=22</th>
<th>Causes of Deaths (n=22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebrovascular diseases</td>
<td>5</td>
<td>Dementia</td>
</tr>
<tr>
<td>Heart failure</td>
<td>3</td>
<td>Urinary tract infection</td>
</tr>
<tr>
<td>Respiratory insufficiency</td>
<td>3</td>
<td>Anemia</td>
</tr>
<tr>
<td>Liver cirrhosis</td>
<td>2</td>
<td>Ophthalmological</td>
</tr>
<tr>
<td>Malignant neoplasm</td>
<td>2</td>
<td>diseases</td>
</tr>
<tr>
<td>Renal failure</td>
<td>1</td>
<td>Pulmonary diseases</td>
</tr>
<tr>
<td>Death from suffocation due to aspiration</td>
<td>1</td>
<td>Mental disorder</td>
</tr>
<tr>
<td>No cause (senescence)</td>
<td>5</td>
<td>Gastrointestinal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>diseases</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cardiac diseases</td>
</tr>
</tbody>
</table>

(2) Osteosclerosis around the stem of the femoral bone marrow cavity was observed in 19 (90%) of the 21 patients, and osteosclerosis at the tip of the stem, i.e., hook image, was observed in 20 patients (95%).

(3) Extension of a clear zone around the stem was observed in only one patient, but the patient was found to have had sinking.

Five patients (24%) had heterotopic ossification at the greater trochanter.

Correlations between these abnormal findings and JOA score were investigated in the patients with abnormal roentgenographic findings on the side of the femur. The patients with varus of the stem and heterotopic ossification had JOA scores of 79.6 points and 82.0 points, respectively. These scores were slightly lower than those in the patients with other abnormal findings (Table 2).

3. Postoperative survival period

The postoperative period ranged from 3.5 years to 10.0 years (mean, 7.2 years) at the time of survey in 20 surviving patients. The postoperative survival period ranged from 2 months to 9.9 years (mean, 2.5 years) in 22 patients who died. Thus, the survival period was only 1/3 of the postoperative period in patients who were alive at the time of survey.

The number of surviving patients and the number of deaths were investigated according to age at surgery. The age distribution for most of the surviving patients was 70-74 years, and that for most of the deaths was 75-79 years (Fig. 4).
The postoperative survival period was less than 3 years in 4 patients aged above 80 years and in 8 patients aged under 80 years, among the 22 patients who died. Thus, the postoperative survival period tended to be short in more of the patients younger than 80 years (Fig. 5). However, the latter age group included 5 patients whose deaths were closely related to preoperative complications. The postoperative survival period in patients under 80 years of age was not always shorter than that in those older than 80 years.

Cerebrovascular disease, heart failure and respiratory failure accounted for 50% of the deaths in the 22 patients, and senescence without distinct cause was responsible in 5 patients (Table 3).

Preoperative complications in the patients who died are shown in Table 4. Hypertension, cerebrovascular disease, pulmonary diseases and cardiac diseases were the main causes of death. A close cause-effect relationship between these preoperative complications and death was considered likely in only 6 patients. However, the mean postoperative survival period in these 6 patients was 11 months, which was shorter than the 4.3 years in patients who died from other causes.

**Discussion**

The present study revealed that the postoperative results in these patients were generally satisfactory in terms of clinical results and roentgenographic evaluation.

In the clinical evaluation, the mean total JOA score was 80.5 points at the time of the final ambulatory examination. This score was almost the same or slightly better than the results of surgery with a unipolar type prosthesis\(^{1,5,6}\), and not inferior even to the results of surgery with a bipolar prosthesis\(^{3,4}\).

Importantly, 16 patients (66.7%) had no pain, which may become an issue postoperatively when the unipolar type prosthesis is used. Including those with only slight pain, the number of patients was 23 (95.8%), a good result. Hayama et al\(^{1}\) and Tsubokawa et al\(^{6}\) have shown delayed treatment to be one of the reasons for poor results. In 8 of our patients, it took at least one month before surgery after injury, and the mean JOA score was 82.4 points. There was no significant difference in score between delayed and fresh cases.

The patients whose age at surgery was 80 years or older tended to show poorer results, probably because of reduced activity due to aging and the presence of complications. In contrast, patients whose age at surgery was under 80 years showed no worsening of results, suggesting that surgery with the unipolar type prosthesis can provide adequate results.

In the evaluation of roentgenograms, central migration was discussed as a problem with the unipolar type prosthesis, but none of the present patients showed this finding.

Sinking was observed in 7 of the 21 patients, but as in other reports\(^{5,6}\), this finding was not related to the worsening of clinical results. In the patient with varus of the stem and the one with heterotopic ossification, however, the results tended to be slightly worse than those in the patients who showed other abnormal roentgenographic findings.

Although there were only a few deaths that were clearly related to preoperative complications, the postoperative survival period was short in the patients who died and in whom the cause of death was closely related to the complications. These results suggest that the evaluation of preoperative complications greatly influences the outcome.

Senile dementia was observed in 41% of the patients who died, but in none of the surviving patients, suggesting that the presence or absence of dementia is closely involved in the outcome.
Conclusions

1. Postoperative outcome was investigated in 44 patients aged 65 years or older who underwent femoral head unipolar type prosthetic replacement for femoral neck fracture in our department.

2. The clinical results showed a mean total JOA score of 80.5. The results from patients whose age at surgery was under 80 years were satisfactory. In the light of the mean life span of Japanese people, treatment with a unipolar type prosthesis is considered adequate for intracapsular femoral neck fracture in elderly patients. Locomotion was possible in 92% of patients.

3. Some patients showed abnormal roentgenographic findings. The clinical results tended to be worse in the patient with varus of the stem and the patient with heterotopic ossification. However, no decrease in clinical results was observed in patients who showed sinking.

4. Twenty-two patients, half of the patients, died during follow-up.

References

高齢者の大腿骨頭部内側骨折に対する Unipolar 型人工骨頭置換術の予後調査
佐賀医科大学整形外科
堤 純 彦・忽 那 龍 雄
小 西 一 生・古 賀 俊 光
梅 村 愛
多久市立病院整形外科
加 藤 利 樹

1981年10月より1990年12月までに当科にてUnipolar型人工骨頭置換術を施行した65歳以上の大腿骨頭部内側骨折症例の44例について（男性8例、女性36例）を対象として、その予後調査を行った。症例の受傷時年齢は、65歳より92歳であり、平均77.4歳であった。

調査時の生存例は20例で、22例がすでに死亡していた。2例は追跡不能であった。

臨床評価としてJOA score は、退院時74.1点が、調査時80.5点と改善しており、移動動作についても92%が歩行可能であった。レントゲン評価では、Central migrationを認めた例はなく、Sinkingは8例に認められた。

死亡例の死因としては、脳血管障害、心不全、呼吸不全などが多々、術前の合併症と死因に関連が見られた6例はその術後生存期間は平均1年以下であった。

Unipolar型人工骨頭置換術の術後成績はBipolar型と比較して大差はなく、今なお有用な治療法であった。