

# Socket wall addition device in the treatment of recurrent hip prosthesis dislocation

Good outcome in 12 patients followed for 4.5 (1–9) years

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**Background** Recurrent dislocation in total hip replacement is difficult to treat and causes severe morbidity.

**Patients and methods** 12 patients suffering dislocations were reoperated with a socket wall addition device (anti-luxation ring) for the Lubinus SPII prosthesis, and were followed up after a mean of 4.5 (1–9) years with regard to redislocation, function and radiographic loosening.

**Results** 1 of the patients suffered a redislocation after almost 7 years of use. There was no loosening during the follow-up time. A Harris hip score of 87 (60–100), a health-related quality of life (EQ-5D) index of 0.8 (0.6–1.0) and total range of motion of 145° (125–165) indicate that the patients had a level of function comparable to that of age-matched hip surgery patients with no complications.

**Interpretation** The anti-luxation ring shows promising mid-term results and seems to provide an alternative to more extensive revision surgery for selected patients.

have been less well documented. After a primary dislocation, the incidence of recurrent dislocation has been reported to be 16–36% (Woo and Morrey 1982, Turner 1994, Joshi et al. 1998). The treatment for recurrent dislocations is a challenge. In the case of malpositioning of a prosthetic component, revision surgery is the best alternative (Soong et al. 2004). In cases where components are not obviously malpositioned, however, the treatment strategy becomes complex. Olerud and Karlström were the first to report treatment with a socket wall addition device (1985). Since then, others have reported various results using similar techniques (Table 1). Since 1994, we have been using a socket wall addition device, the anti-luxation ring 180° (ALR) (Waldemar Link GmbH, Hamburg, Germany) (Figure), together with the Lubinus SPII prosthesis in selected cases. We studied the long-term functional and radiographical results of using this device.

Dislocation is one of the most common complications of total hip replacement (THR), with an incidence of 0.6–4% (Masonis et al. 2002). Risk factors include indication for THR (Lee et al. 1998), surgical approach (Masonis et al. 2002), femoral head size (Woo and Morrey 1982), positioning of the prosthetic components (McCollum and Gray 1990, Barrack 2003), and experience of the surgeon (Hedlundh et al. 1996, Katz et al. 2001). Recurrent dislocations cause severe morbidity, but

## Patients and methods

14 patients who underwent revision surgery at the Department of Orthopedics, Gällivare Hospital, during 1994–2002, with application of an anti-luxation ring (ALR) as the only procedure, were identified in the computerized patient journal system and were invited to participate in the study. 12 patients (6 men) gave their written consent. The mean age of the patients at the time of the THR was 69 (58–83)

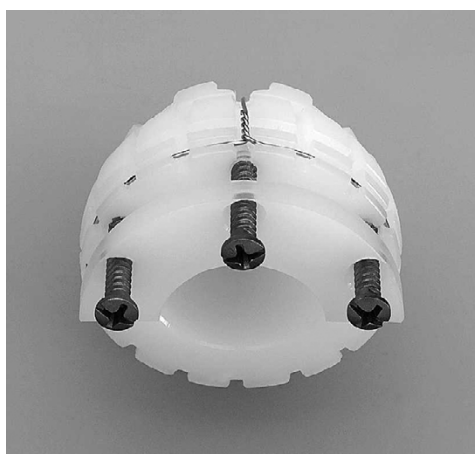
Table 1. Previous studies on socket wall addition devices

| First author               | Year | N <sup>a</sup> | F-U<br>(months) | L <sup>b</sup> | R <sup>c</sup> | Details (method)                         | Authors' conclusions                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|------|----------------|-----------------|----------------|----------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Favorable outcome</i>   |      |                |                 |                |                |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Olerud                     | 1985 | 6              | 9–36            | No             | 0              | First study.                             | A simple method; particularly attractive for patients who have had several previous hip operations. The procedure of choice in most cases of instability requiring operation. A simple and effective treatment. Simpler to perform than revision, and little morbidity. Thin segments and cortical screws recommended. Similar functional outcome to that of patients with revision surgery. A simple and effective procedure. |
| Mogensen                   | 1986 | 2              | 7, 13           | –              | 0              | Case report (Olerud)                     |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Güngör                     | 1990 | 13             | 12              | –              | 1              | Brief report (Olerud)                    |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Bradbury                   | 1994 | 16             | 36              | No             | 3              | (Olerud and Wroblewski)                  |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Nicholl                    | 1999 | 28             | 26              | –              | 5              | (Olerud and Wroblewski)                  |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Charlwood                  | 2002 | 20             | 24              | No             | 0              | Retrospective comparison <sup>d</sup>    |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Madan                      | 2002 | 68             | 35              | –              | 16             | (Wroblewski)                             |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <i>Unfavorable outcome</i> |      |                |                 |                |                |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Gie                        | 1989 | 10             | 11.5            | –              | 3              | Brief report (Olerud)                    | Problems with impingement. Revision arthroplasty should be considered for recurrent dislocations. The method should be abandoned. 5 screws are needed.                                                                                                                                                                                                                                                                         |
| Reikerås                   | 1989 | 3              | 3–24            | –              | 3              | Case report (Olerud)                     |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Williamson                 | 1989 | 3              | 6–18            | –              | 3              | Case report (Olerud)                     |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Watson                     | 1991 | 2              | 7, 18           | –              | 1              | Preliminary report. Charnley prosthesis. |                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Total                      |      | 171            | 3–36            |                |                |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                |

<sup>a</sup> N – number of patients;  
<sup>b</sup> L – loose prosthesis components on follow-up radiographs, – = not analyzed;  
<sup>c</sup> R – number of redislocations.  
<sup>d</sup> Retrospective comparison with 20 patients who had revision surgery.

years. The indications for the THR had been primary osteoarthritis, revision due to aseptic loosening, femoral neck fracture and secondary osteoarthritis. The indications for revision surgery with an ALR ring were recurrent dislocations, subdislocations,

dislocation that was not reducible by closed reduction, and dislocation with suspected retroversion of the acetabular component. The mean time between the THR and the ALR surgery was 2 (0–4) years (Table 2). The patients were interviewed and given a



The anti-luxation ring 180° is fixed onto the acetabular component with 3 screws.

Table 2. Background data on patients, and results

| A      | B   | C | D | E  | F   | G | H  | I   | J   | K    | L    | M    |
|--------|-----|---|---|----|-----|---|----|-----|-----|------|------|------|
| 1      | 58  | F | C | OA | 8   | 1 | D  | 66  | 87  | 0.69 | 150° | 25°  |
| 2      | 59  | F | A | OA | 0.5 | 1 | NR | 72  | 82  | 1.00 | 140° | 25°  |
| 3      | 59  | M | A | OA | 25  | 4 | D  | 103 | 100 | 0.62 | 140° | 30°  |
| 4      | 65  | M | A | OA | 52  | 1 | SD | 81  | 79  | 1.00 | 130° | 45°  |
| 5      | 68  | M | A | OA | 30  | 7 | D  | 110 | 98  | 0.69 | 165° | 15°  |
| 6      | 69  | F | C | OA | 49  | 3 | D  | 24  | 78  | 0.80 | 150° | –10° |
| 7      | 69  | M | B | R  | 8   | 4 | D  | 26  | 87  | 1.00 | 140° | 30°  |
| 8      | 70  | F | B | OA | 43  | 3 | D  | 29  | 100 | 0.73 | 160° | –5°  |
| 9      | 75  | M | A | OA | 50  | 2 | D  | 66  | 90  | 0.69 | 165° | –25° |
| 10     | 76  | F | C | R  | 3   | 2 | D  | 16  | 63  | 0.59 | 115° | 10°  |
| 11     | 77  | M | A | F  | 0   | 1 | R  | 31  | 60  | 1.00 | 125° | 20°  |
| 12     | 83  | F | A | SA | 6   | 3 | D  | 25  | 98  | 0.81 | 165° | 0°   |
| Mean   | 69  |   |   |    | 23  |   |    | 54  | 85  | 0.80 | 145° | 13°  |
| Median | 69  |   |   |    | 17  |   |    | 49  | 87  | 0.77 | 145° | 18°  |
| SD     | 7.9 |   |   |    | 21  |   |    | 33  | 14  | 0.16 | 17   | 20   |

A Patient

B Age

C Sex

D Charnley type

E Indication for total hip replacement (THR):

OA primary osteoarthritis,

R revision due to aseptic loosening,

F femoral neck fracture,

SA secondary osteoarthritis.

F Months THR to anti-luxation ring (ALR)

G Number of dislocations

H Indication for ALR:

D recurrent dislocations,

NR dislocation that was not reducible by closed reduction,

SD recurrent subdislocations,

R dislocation with suspected retroversion of the acetabular component.

I Follow-up (months)

J Harris hip score

K EuroQol index (EQ-5D)

L Range of motion (flexion + abduction + adduction + external rotation in extension)

M Difference in range of motion between the sides

questionnaire including the Harris hip score (HHS) (Harris 1969) and EQ-5D (Brooks 1996). Clinical examination was performed and radiographs were recorded. For loose femoral components, the Mullroy and Harris definition and 100% radiolucent lines were used (Mullroy and Harris 1997). For loose acetabular components, Hodkinson type 3 and 4 was used (Hodkinson et al. 1988). For statistical analysis, a paired Student's t-test was used at a rejection level of 5%.

## Results

1 patient (no. 4) suffered a redislocation. This patient was operated on because of recurrent sub-

dislocations, and has had the ALR for almost 7 years. None of the patients fulfilled the criteria used for a loose femoral or acetabular component. 8 of the patients had an HHS that was good (80–90) or excellent (90–100) (Harris 1969). Range of motion was limited ( $p < 0.05$ ) in the ALR-operated hip compared to the contralateral side. Detailed results are presented in Table 2.

## Discussion

The good mid-term results after this simple operation are somewhat surprising, with only 1 patient suffering redislocation during the 4.5 years of follow-up. The EQ-5D index was 0.8 and can

be compared with the figure of 0.73 which was reported from a 6-year follow-up of 1,401 THR patients in southern Sweden, also including patients in all Charnley categories (A, B and C) (Charnley 1972, Swedish Total Hip Replacement Register 2002). Also, the HHS of 87, and 8 of 12 with good or excellent outcome, indicate that our patients do have a level of function that is similar to that of other age-matched hip surgery patients. The range of motion was reduced compared with the contralateral side. This is to be expected, because of the fact that the ALR itself limits the range of motion, and also probably because the hip has undergone surgery several times; scarring of the soft tissues may limit range of motion, but this seems to be of minor importance.

Different constrained designs limit range of motion and thereby increase forces over the bone-prosthesis interface. This may in turn lead to a risk of early loosening. Cobb et al. (1996) reported a lower incidence of dislocation when using an elevated rim acetabular liner, but they also had concerns about the long-term results, because elevated acetabular liners can increase impingement and thereby increase component wear—with the possibility of osteolysis. However, in a follow-up study, these authors could not demonstrate any difference in the cumulative incidence of revisions due to loosening, when comparing elevated and normal acetabular rims (Cobb et al. 1997). None of the studies in Table 1 describe any loose femoral or acetabular components, although only 3 of them have specifically addressed this issue. Likewise, we found no cases of loosening.

Recurrent dislocation of hip prostheses remains a problem. Since the first report of using a socket wall addition device by Olerud and Karlström in 1985, others have reported promising results using the same or similar techniques (Mogensen et al. 1986, Güngör and Hallin 1990, Bradbury and Mulligan 1994, Nicholl et al. 1999, Charlwood et al. 2002, Madan et al. 2002), whereas others have reported less promising results (Gie et al. 1989, Reikerås et al. 1989, Williamson et al. 1989, Watson et al. 1991). Various technical issues have been discussed, such as the thickness of the socket wall addition device (Graham et al. 1988) and the number of fixation screws (Watson et al. 1991). A special device has been developed for some pros-

theses. Several reports have been published on the use of the Wroblewski wedge augmentation (DePuy International Ltd, Leeds, UK) developed for the Charnley prosthesis (Bradbury et al. 1994, Nicholl et al. 1999, Madan et al. 2002). The ALR we used was developed for the Lubinus SPII prosthesis, and we have found no other reports on the use of this device.

#### *Author contributions*

AE, JM clinical examination, radiographic analyzing and design of study. OS design of study.

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