VARIA-THEMA

CLINICAL APPLICATION STUDY OF A DYNAMIC HIP ORTHOSIS FOR POSTOPERATIVE HIP DISLOCATION AFTER TEP

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Summary

Clinical application study by the Orthopedic Department of Hohenurach Specialist Hospital regarding a dynamic hip orthosis on 16 patients following endoprosthetic replacement of the hip joint and subsequent dislocation due to muscular insufficiency. The recurrence of dislocation was effectively prevented by the orthosis in all cases. The dynamic design principle permitted and reinforced the physiotherapy essential for strengthening the muscels surrounding the hip. Patient acceptance of orthosis was extremely high.

Preliminary remarks

In the calender year 2004, almost 170.000 endoprostheses of the hip joints were implanted in Germany. The dislocation of an artificial joint is a not uncommon early complication primarily in the first phase of rehabilitation. The literature reports dislocation rates of 2.5% (GROSSMANN et al., 1994), 2.1% (KOHN et al., 1997), 1-2% (SCHNEIDER et al., 1996) and 1.21% (THEIL, et al., 2001) following primary surgery. With revision procedures the dislocation rate is considerably higher at 5.34% (THEIL, et al., 2001).

The main reason is not so much due to surgical error as to muscular insufficiency of the generally geriatric multimorbid patients, as well as the inadequate provision of information to patients about kinetic patterns causing dislocation.

The following can be listed as particular **risk factors:**

- Surgical errors
  - Incorrect position of the implanted socket (too steep)
  - Lack of anteversion or even retroversion of the hip socket
  - Excessively deep resection at the femoral neck with insufficient head/neck length
  - Inadequate refixation of the greater trochanter (after intraoperative osteomy or fracture)
- Patient-related factors
  - Age over 70 years with a weakening of the muscles surrounding the hip
  - Revision surgery (removal of hematoma, replacement of prosthesis, etc., Fig. 1)
  - CCD angle over 142 degrees
  - Dorsal approach
- Errors during postoperative rehabilitation: Inadequate provision of information to patients about postures and movements encouraging dislocation, such as
  - getting up from deep sitting with the afflicted leg
  - abduction movements of the afflicted leg beyond the centerline (crossing of legs)
  - excessive hip flexion (e.g., when putting on shoes or socks)
  - excessive outside rotation during walking but also during the kinotherapeutic bath with eased muscular dynamogeny.

For the prevention of dislocation of hip endoprosthesis in the early stage of postoperative rehabilitation, the following **important information** concerning behavior patterns should be observed:

- No deep seating; use a cushion to sit higher, also on the toilet
- Temporary use of an elevated bed (hospital bed, second mattres in normal bed)
- Use of adequate aids to avoid excessive hip dislocation (e.g., stump, donning aid, special grippers, etc.)
- Use of special positioning cushions between the knees when resting on the non-operated side
- Use of forearm crutches with anti-slip adhesive buffers, especially to avoid falling of insecure patients with required partial loading of the extremity operated on.

Method

Each year, some 1500 patients are admitted to the Orthopedic Department of Hohenurach Specialist Hospital in Bad Urach as in-patients for subsequent curative treatment, either with newly implanted total hip replacements or following revision

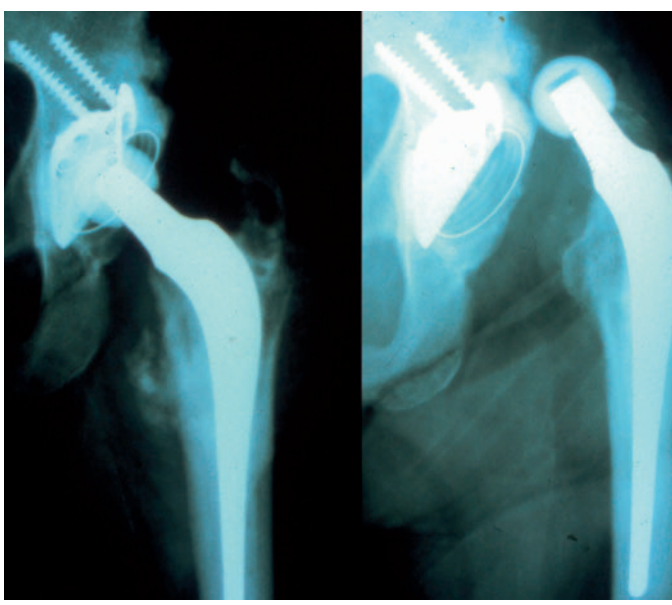

Fig. 1: Spontaneous displacement of the total hip replacement, left with muscular instability

procedures. In the ten month between 20th November 2003 and 25th September 2004, a total of 16 patients who had experienced dislocation of the arthroplasty following the performance of non-operative reduction were treated with the DynaCox dynamic hip orthosis (Wilhelm Julius Teufel GmbH).

Fig. 2: Dynlax Hip orthosis right for patient with postoperative instability of the hip joint

During this period (general inpatient treatment, followed by out-patient treatment), we observed the efficacy of the orthosis in relation to recurrence of dislocation, wearer comfort, acceptance among patients and the possibility of training the muscle surrounding the hip while an orthosis was worn.

Functional principle of the orthosis

The partly immobilizing hip girdle consists of a compressive knitted structure with a built-in orthotic brace. The knitted structure acts to compress the wound area and the soft tissue surrounding the hip. The firm orthotic brace holds the femoral head in its socket according to the 3-point principle. A knee cuff is used for guidance of the femur (Fig. 2). Flexion in the homolateral hip joint is permanently limited to 70°, while extension is freely possible. Adduction is counteracted by elastic abduction pretensioning of 20°. This flexible pre-tensioning allows the patient to move the affected leg under the body's centre of gravity and to train the hip muscles spanning the joint.

Case reports

The patient population consisted of 16 patients, 8 women and 8 men. The mean age was 70 years, with the youngest patient being 56, and the oldest patient 85 years of age. With 6 patients the orthosis was fitted after the first dislocation while the other patients had experienced more than one dislocation before the orthosis was used. The mean wearing period of the DynaCox was 7.3 weeks. One patient was able to wear the orthosis only for 4 weeks as further knee surgery was planned. The longest wearing period was 10 weeks (Table 1).
Thanks to its extremely flat design the orthosis is inconspicuous under clothing and can also be worn at night while sleeping, which contributed to the high level of patient acceptance. The minor restriction in freedom of leg movement and the flexible joint design combined with a secure hold of the femoral head allowed patients to develop a normal gait pattern again and participate in physiotherapy exercises also wearing the orthosis.

Results

With 14 (87.5%) treatments there were no other dislocations or complications of any kind. The hip situation healed normally.
One female patient suffering from dementia opened the tags of the orthosis unnoticed so that it no longer had any effect and rump rotation subsequently caused dislocation. Once the front tag was equipped with an additional magnetic catch that could only be opened by the nursing staff, it was possible to complete the treatment without further problems or dislocation also in this case. One patient

Table 1: Orthotic treatment at patients with hip luxation after endoprostesis

Patients with DynaCox Hip orthosis (20.11.2003-25.09.2004)	
Number of cases	16
- women:	8
- men:	8
average age:	70 years (56–85 years)
Number of hip luxations before treatment:	
1 luxation:	6 patients
>1 luxation:	10 patients
Ø-wearing time of the orthosis:	7,3 weeks (4–10 weeks)
daily wearing time of the orthosis:	24 hours

was obliged to undergo revision surgery at a later stage as the socket had been inserted far too steeply and the femoral head could not be secured despite the orthosis.

In the case of one particularly obese patient the abdomen was precompressed with a universal abdominal bandage ("Silva"; Wilhelm Julius Teufel GmbH) in addition to the orthosis, something that proved to be highly advantageous for the positioning of the orthosis.

Fig. 3: DynaCox Hip orthosis (lateral view)

Conclusions

Based on our own experience with a large number of patient cases, at a rate of 1.59% (following primary TEP) and a considerably higher rate of 5.34% after revision surgery, the dislocation of a hip replacement is a problem that must be taken seriously during the subsequent curative treatment.

The main reason for dislocation of the artificial joint is muscular atrophy and dysbalance of the muscles surrounding the hip, especially in elderly patients.

Following non-operative reduction of the femoral head, 16 patients were treated with a DynaCox hip orthosis. This was effective in preventing any recurrence of dislocation. The orthosis barely interfered with performance of the physiotherapy exercises necessary to strengthen the hip muscles thanks to its dynamic design. It was possible to re-establish a normal gait pattern in all cases despite the orthosis being worn.

In the case of a hip with muscular instability, which can also be reduced very easily, it is recommended that the dynamic anti-dislocation be worn for 12 weeks.

Four to 6-week immobilization in plaster or treatment with a conventional rigid hip orthosis is, according to us, only necessary in individual cases. After the end of treatment with the orthosis it is essential to provide adequate information to patients about kinetic patterns that are temporarily to be limited.

At present, the treatment philosophy of preventing redislocation we follow in this hospital is this: If the dislocated prosthesis can be fixed without much problem (i.e., without substantial muscle-relaxing medication), the primary assumption is that of insufficient stability of the musculature surrounding the hip. Under this aspect, the direct next step is the provision of an anti-dislocation orthosis. This solution is also preferred if primarily the position of the prosthesis is unfavorable for surgical intervention. If prosthetic relocation requiers anesthesia and the X-ray does not show any significant distinctive features concerning surgery, orthotic immobilization can be dispensed with at that stage. A suitable anti-dislocation orthosis is also prescribed in cases of redislocation. As a matter of principle, all patients receive individual treatment for further rehabilitation. The particular emphasis is on building strength by training the pelvitrochanterial muscles. The afflicted leg is placed in a Swiss-type abduction splint at a triangle position in bed for a period of at least six weeks. If redislocation should occur despite these precautions (which occurred merely once during our study), a suitable anti-dislocation orthosis is prescribed.

Fig. 4: universal abdominal bandage "Silva"

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