



Resection of heterotopic ossification of the hip in spinal cord injured patients

T Meiners¹, R Abel², V Böhm¹ and HJ Gerner³

¹Werner-Wicker-Klinik, Department I, Im Kreuzfeld 4 34537 Bad Wildungen; ²Orthopädische Klinik der Universität Düsseldorf, Moorenstr. 5, 40225 Düsseldorf; ³Orthopädische Universitätsklinik, Schlierbacher Landstr. 200 A, 69118 Heidelberg, Germany

Twenty nine spinal cord injury patients were treated by resection of heterotopic ossification in 41 hips. The average follow-up period after surgery was 4.2 years. The mean time to surgery after injury was 82.1 months. The indications for surgery were seating problems, loss of function, pressure sores and pain. The average preoperative motion in flexion and extension was 21.95°, the average intraoperative motion was 94.51°. The average motion at follow-up evaluation was 82.68°. Clinical relevant recurrence occurred in three patients. Complications excluding recurrence occurred in 10 hips, including deep and superficial wound infections, fracture, aneurysm and pressure ulcer. The operation was followed by a specific regime of physiotherapy and radiation therapy.

Keywords: heterotopic ossification; hip; paraplegia; operation; results

Introduction

The incidence of heterotopic ossification in paraplegic patients has been reported differently since the first description by Dejerine-Klumpe.¹ The figures given in the literature vary around 30%.^{2,3} In a prospective study 18.5% of paraplegic patients developed clinically significant heterotopic ossifications.⁴ Doubtless clinical experience, awareness of this disease and the aggressiveness in applying appropriate imaging techniques are important factors towards the data collected.

When there is significant reduction of hip joint movement because of heterotopic ossification, there is always a discussion about the effectiveness of a surgical procedure to resolve the problem. In the literature there are reports that resection is often associated with severe complications and a poor outcome. This is contrary to our own results, which have been previously summarised, in 1991.⁵ The objective of this study is to re-evaluate our own concept of managing heterotopic ossifications and to compare our data with the results of other authors.

Materials and methods

The data presented were collected from the files of patients admitted for surgery. Additional data was gathered from records of inpatient treatments not related to the hip-surgery, as well as from records of our outpatient clinic.

The diagnosis was made by clinical examinations and x-ray studies. Computerised tomography and

scintigraphy were used routinely but are not the subject of the present study. The range of motion was determined in flexion and extension, and measurements were made pre- and postoperatively by the admitting physician. The intraoperative measurement was recorded by the surgeon.

A ventral approach was used for the surgery, and the ossifications were removed following functional criteria. (Figures 1 and 2). We tried to preserve the joint, but in some cases a resection arthroplasty with removal of the femur head and parts of the neck (Girdlestone-Procedure) was necessary. This was done if during surgery a fracture occurred or postoperative fractures seemed very likely. Usually the decision for a resection was made, if the femoral neck could be easily indented by finger pressure.

In the first postoperative week all patients underwent irradiation of the hip using a linear accelerator for high energy irradiation.

During the first 14 days no passive movement exercises were allowed. Beginning with day 15 continuous passive motion was used to achieve suitable flexion for mobilisation into the wheelchair (70 to 90 degrees). Passive motion exercises were continued during the period of wheelchair mobilisation. The patients were discharged after reaching the intraoperatively measured range of motion and after we were satisfied that individual patients could use the newly gained function in his activities of daily living.

From July 1985 to March 1996, 31 patients with a spinal cord injury were operated on 43 hips for limitation of hip-joint motion due to heterotopic ossifications. This was carried out in the Spinal Cord



Figure 1 Preoperative radiograph of hip joints, showing heterotopic ossification

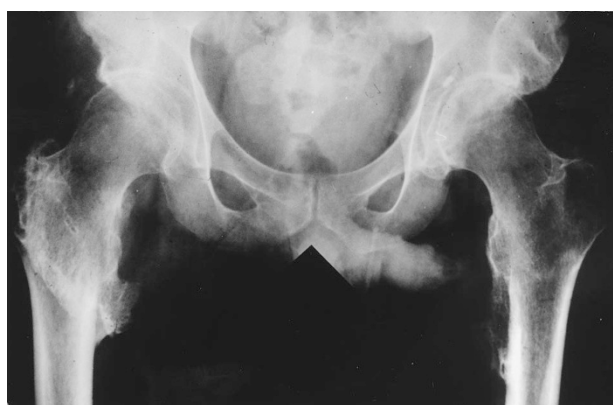


Figure 2 The postoperative radiological solution

Injury Unit of the Werner-Wicker-Klinik, Bad Wildungen, Germany. For two patients no adequate data could be obtained. We could process the data of 28 males and one female patient, who between them had a total of 41 hip-joints operated on. The mean age was 37.87 years (23.27–68.13 years). Eighteen left and 23 right hips were affected. Ten patients had a cervical lesion of the spinal cord, five with complete tetraplegia and five with incomplete tetraplegia. Nineteen patients had a thoracic spine lesion (Th 1–Th 12), 17 with a complete lesion and two with incomplete lesions. In all of the patients the spinal cord lesion resulted from trauma. Only two patients had flaccidity, all of the other patients showed spasticity. Surgery was performed 82.1 months (17–298) after the spinal cord injury.

The indications and problems leading to the operative management were pain, pressure sores, loss of function and loss of an adequate sitting position. These are listed in the order of frequency. Sometimes multiple problems were present (Table 1).

Results

The mean follow-up was 4.2 years (18–123 months). The preoperatively measured range of motion of 41

hips was found to be 21.95 degrees (0–80 degrees). At the end of the surgical procedure an average range of motion of 94.51 (60–120 degrees) could be achieved. Follow-up measurements showed an average of 82.68 degrees (80–120 degrees). This translates into an average gain in range of motion (after a mean of 4.2 years) of 60.73 degrees (0–120 degrees). Furthermore the loss in the range of motion comparing the intraoperative range and the findings at follow-up was 11.83 degrees (–90–30 degrees) (Table 2).

For five patients the net gain in range of motion was less than 30 degrees. One of these patients had recurring ossification with a rapid loss of motion ability. Another patient sustained a fracture of the femoral neck 3 months after being discharged; this occurred during physical therapy, and this incident resulted in a loss of the previously achieved gain of motion. The third of these patients had had the hip operated on three times before being referred to us, and he also developed a recurrence 3 months following discharge, resulting in a stiff hip.

The remaining two patients with a net gain less than 30 degrees had a relatively good range of motion before surgery. One had a preoperative range of flexion/extension of 80 degrees with painful ending of flexion. He only gained 10 degrees, but his problem could be resolved. The last of these patients had a preoperative range of motion of 50 degrees and gained only 20 degrees.

Regarding complications, there was, as has already been mentioned, fracture of the femoral neck, two patients with deep infections required a total of eight surgical revisions (5 and 3), three superficial wound infections required two surgical revisions. One patient developed an aneurysm of the femoral artery and required further surgery, and three patients developed superficial pressure sores, none of which required surgical intervention (Table 3).

The mean intraoperative bloodloss was 1700 ml (250–5600 ml). Eighteen times the intraoperative bloodloss was more than 1700 ml.

Table 1 Indication for operation*

	<i>n</i>
Seating problems	31
Loss of function	21
Decubitus	9
Pain	6

*Multiple mention possible

Table 2 Range of motion

Preop	21.95°	(0–80°)
Intraop	94.51°	(60–120°)
Follow-up 4.2 years	82.68°	(0–120°)

Table 3 Complications

Type	Operation
2 joint infections	5/3
3 superficial infections	2
1 fracture	0
1 aneurysm	1
3 pressure ulcers	0

Table 4 Patient's – assessment

Category	n (hips)
1	23
2	10
3	4
4	4

1 = satisfied without any restrictions. 2 = satisfied with some restrictions. 3 = partly satisfied with restrictions. 4 = completely not satisfied, expectations not fulfilled

Twelve hips were too brittle to be preserved. The femoral head and parts of the femoral neck were resected, resulting in a Girdlestone arthroplasty. For these 12 hips the mean bloodloss was 2800 ml (600–5600 ml) whereas the mean bloodloss for joint preserving procedures was 1250 ml (260–5400 ml). The range of motion for preserved joints at the time of follow-up was 55.6 degrees (0–120 degrees), in the other group a mean of 74.6 degrees (0–120 degrees) was found. The two patients with recurrent ossification leading to stiff hips and the two patients with a deep wound infection were seen in the group of patients who had resection of the hip joint. Thirty six hips received radiation treatment with an average of 9.17 Gy (0.7–12 Gy) in one to five sessions.

The patients were asked to categorise their satisfaction concerning the results of the procedure, using a nominal scale (Table 4). The average result was 1.7. There was no significant correlation between the resulting range of motion and satisfaction, and the level of the neurological lesion or the duration of the disease.

Discussion and conclusions

The limited range of motion of hips resulting from heterotopic ossifications in patients with a spinal cord

injury can be improved substantially by surgery. There is some loss of motion over time, but this usually does not affect the functional outcome.

We found fewer complications after procedures in which the joint could be preserved. The range of motion which could be achieved was greater with Girdlestone procedures, but the incidence of complications after this operation is higher. Overall, complications are much higher than in other forms of elective hip surgery (eg total hip replacement).

We believe that the results are due to the controlled facilities of a spinal cord unit, careful physiotherapy and postoperative radiation therapy. Our results are better than the comparable ones reported previously.^{3,6} The difference in our approach is the use of radiation therapy and possibly also strict timing and the cautious use of movement exercises. Radiation therapy has been reported to be effective in preventing heterotopic ossification after total hip replacement,^{7,8} and also appears to be effective for the prevention of recurring heterotopic ossification in spinal cord injured patients. Last, but definitely not least is the fact that the patients are in general satisfied with the results of the treatment.

References

- Dejerine AA, Ceillier A. Para-ostéopathies des Paraplégiques par lésion médullaire: Etude clinique et radiographique. *Ann Med* 1918; **5**: 497.
- Gerner HJ. Die Querschnittlähmung Blackwell Wissenschaftsverlag, Berlin 1992.
- Stover SL, Niemann K, Tulloss J. Experience with surgical resection of heterotopic bone in spinal cord injury patients. *Clin Orthop* 1991; **263**: 71–77.
- Garland DE, Alday B, Venos KG, Vogt JC. Diphonate treatment for heterotopic ossification in spinal cord injury patients. *Clin Orthop* 1983; **176**: 197–200.
- Gerner HJ, Graul EH, Graul H. Michelbrink: Die Paraosteoarthropathie (POA) bei Querschnittgelähmten. In: Graul EH, Pütter S (Hrsg.): Medizin und Grenzgebiete-Perspektiven für die 90er Jahre. Bd.II.Iserlohn:Medice-Hausdruck 1991; pp.1011–1022.
- Garland DE, Orwin JF. Resection of heterotopic ossification in patients with spinal cord injuries. *Clin Orthop* 1989; **242**: 169–176.
- Ayers DC, Pellegrini VD, Evarts CMcC. Prevention of heterotopic ossification in high-risk patients by radiation therapy. *Clin Orthop* 1991; **263**: 87–93.
- Pellegrini VD, Gregoritch SJ. Preoperative irradiation for prevention of heterotopic ossification. *J Bone Joint Surg* 1996; **78A**: 870–881.