The greatest improvement occurred between 3 and 8 weeks after the injury, and in most cases continued up to one year. 3) The patients assessed activities of daily living as normal already after 8 weeks, although the objective assessment showed a continued improvement up to 24 weeks and one year after the injury. Checking of the results and objective assessment is therefore of great importance.

Our results with exact figures in tables can be obtained from the authors upon request.

REFERENCES


CONCLUSIONS

1) Instruction in self-training compared with conventional physiotherapy gave the same results in patients with none-displaced or slightly displaced fractures of the proximal end of the humerus. 2) The greatest improvement occurred between 3 and 8 weeks after the injury, but in most cases continued up to one year. 3) The patients assessed activities of daily living as normal already after 8 weeks, although the objective assessment showed a continued improvement up to 24 weeks and one year after the injury. Checking of the results and objective assessment is therefore of great importance.

Our results with exact figures in tables can be obtained from the authors upon request.

REFERENCES


ABSTRACT. Gait, hip muscular function and clinical features were analysed in 5 patients with chondrosarcoma of the pelvis operated with removal of the tumor, including the acetabular ring. The lower extremity thus remained intact. The aim of this study was to compare the functional results with those obtained in a previous investigation two years earlier. The same tests were used, but more attention was focussed to the functional part and thus step length, gait velocity, and active range of motion were added. At both examinations none of the patients had pain. All performed surprisingly well as regards work and gait. Clinical and objective findings were, however, less impressive. There was a direct relationship between hip extension strength and weight bearing on the operated leg, gait velocity and maximal walking distance. Moreover, the extension strength was also related to the formation of a new acetabular roof and to the age of the individual represented, with preference to the young. Compared with the previous examination, 2 patients had made remarkable progress, 2 were unchanged but still showed good results and one showed less good results.

Key words: Chondrosarcoma; pelvic tumour; gait; muscle force; acetabulizing.

MATERIAL

Of the 7 earlier examined patients with chondrosarcoma operated with local extirpation of the pelvic tumour and with preservation of the limb (Figs. 1, 2), 2 had died of metastatic disease. Four men and one woman between 27 and 73 years of age remained. None of these had known metastases. Time of follow-up was 4 years 8 months, 8 years 8 months, 3 years 9 months, 11 years 11 months and 8 years (Table II). All patients had had the muscles iliacus, sartorius, rectus femoris and the adductors transected and the muscles biceps femoris, semimembranosus and semitendinosus detached from the ischial tuberosity in order to extirpate the tumour. For further details, see Table II.

One patient (A. K.) had prior to this investigation had one local metastatic soft tissue tumour in the hip region extirpated after the initial pelvic operation.

Another patient (A. K.) had had seven soft tissue tumours in the hip region extirpated. Part of the gluteus maximus muscle had been removed.

Aim of this Study

As this examination laid more stress on function, the following questions were asked:


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.

A FOLLOW-UP EXAMINATION OF THE FUNCTION OF THE LOWER EXTREMITY AFTER PELVIC TUMOUR EXTRATION INCLUDING THE ACETABULAR RING


Eva Solem Bertoft et al.
Table I. Material

<table>
<thead>
<tr>
<th>Patient</th>
<th>No</th>
<th>Sex</th>
<th>Age I</th>
<th>Age II</th>
<th>Follow-up</th>
<th>Removal of femoral head</th>
<th>Leg length difference</th>
<th>Formation of new roof</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. H.</td>
<td>2</td>
<td>M</td>
<td>71</td>
<td>73</td>
<td>2 yrs 8 m</td>
<td>4 yrs 10 m</td>
<td>–</td>
<td>6 cm</td>
</tr>
<tr>
<td>A. K.</td>
<td>3</td>
<td>F</td>
<td>66</td>
<td>68</td>
<td>6 yrs 7 m</td>
<td>8 yrs 8 m</td>
<td>Yes</td>
<td>8 cm</td>
</tr>
<tr>
<td>R. S.</td>
<td>4</td>
<td>M</td>
<td>33</td>
<td>35</td>
<td>1 yr 6 m</td>
<td>3 yrs 9 m</td>
<td>–</td>
<td>2.5 cm</td>
</tr>
<tr>
<td>D. K.</td>
<td>5</td>
<td>M</td>
<td>59</td>
<td>61</td>
<td>9 yrs 10 m</td>
<td>11 yrs 11 m</td>
<td>Yes</td>
<td>6 cm</td>
</tr>
<tr>
<td>K. L.</td>
<td>6</td>
<td>M</td>
<td>25</td>
<td>27</td>
<td>5 yrs 11 m</td>
<td>8 yrs</td>
<td>–</td>
<td>6 cm</td>
</tr>
</tbody>
</table>

Examination I, previous study 1980. Examination 2, present study 1982.

METHOD

Clinical Examination

Besides the above-mentioned features being examined, the functional leg length difference was measured by placing plates under the foot of the operated leg until the anterior superior spines were horizontal.

Table II. Detailed surgical procedures for each patient

<table>
<thead>
<tr>
<th>Patient</th>
<th>Osteotomies</th>
<th>Ilipsoas</th>
<th>Hamstrings</th>
<th>Rectus femoris</th>
<th>Sartorius</th>
<th>Adductors</th>
<th>Glutei</th>
<th>Lig. sacro-tubare and sacro-spinitale</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. H.</td>
<td>Close to the symphysis. Just proximal to ilium ischiadica. A few cm of the anterior part of the iliac crest is removed.</td>
<td>Blacons divided</td>
<td>Origins divided</td>
<td>Divided</td>
<td>Divided</td>
<td>Larger part released</td>
<td>Released</td>
<td>Divided</td>
</tr>
<tr>
<td>A. K.</td>
<td>In the symphysis. Through ilium, I am proximal to the acetabulum, dorally towards ilium ischiadica in the symphysis. At incision ischiadica Blacons and ilipsoas divided. Divided close to insertion.</td>
<td>Suture to anterior superior spine</td>
<td>Decorticated from iliac tuberosity</td>
<td>Suture to anterior superior spine</td>
<td>Suture to anterior superior spine</td>
<td>Divided medially</td>
<td>Alas osis ili dissected free. Suture to ext. termus superior</td>
<td></td>
</tr>
<tr>
<td>K. S.</td>
<td>Blacons and ilipsoas divided.</td>
<td>Released</td>
<td>Origin divided</td>
<td>Origin divided</td>
<td>Divided at insertions</td>
<td>Released</td>
<td>Divided</td>
<td></td>
</tr>
<tr>
<td>D. K.</td>
<td>Three cm proximal to the acetabulum. Ilia ischiadica is dissected free. Through incision in paths of the opposite side. Just proximal to the acetabulum.</td>
<td>Released blurry</td>
<td>Released</td>
<td>Released</td>
<td>Released from alas osis ili</td>
<td>Lig. sacro-spinitale divided</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K. L.</td>
<td>Origins divided</td>
<td>Released</td>
<td>In- and outside of alas dissected free</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No detailed report in the muscular reconstruction.

Scand J Rehab Med 19
1. Pain on weight bearing, motion and at rest?
2. Maximal walking distance?
3. Need of walking aids?
4. Work capacity?
5. Leisure activity?
6. Technical aids?

7. Ability to ride a bicycle?
8. Ability to climb stairs?

Furthermore, the patients were asked if they had reached a state, that they considered permanent or if they thought that they could be further improved.

---

**Fig. 1.** Resected area of pelvis in patient K. S.

**Fig. 2.** Radiographs of patient in Fig. 1. Left: Immediately following surgery. Right: 19 months postoperatively. Note formation of new roof.

---

**Table I. Material**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Sex</th>
<th>Age</th>
<th>I</th>
<th>Follow-up</th>
<th>II</th>
<th>Removal of femoral head</th>
<th>Leg length difference</th>
<th>Formation of new roof</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. H.</td>
<td>M</td>
<td>71</td>
<td>73</td>
<td>2 yrs 8 m</td>
<td>4 yrs 10 m</td>
<td>–</td>
<td>6 cm</td>
<td>Yes</td>
</tr>
<tr>
<td>A. K.</td>
<td>F</td>
<td>66</td>
<td>68</td>
<td>6 yrs 7 m</td>
<td>8 yrs 8 m</td>
<td>–</td>
<td>8 cm</td>
<td>Yes</td>
</tr>
<tr>
<td>K. S.</td>
<td>M</td>
<td>33</td>
<td>35</td>
<td>1 yr 6 m</td>
<td>3 yrs 9 m</td>
<td>–</td>
<td>2.5 cm</td>
<td>Yes</td>
</tr>
<tr>
<td>D. K.</td>
<td>M</td>
<td>59</td>
<td>61</td>
<td>9 yrs 10 m</td>
<td>11 yrs 11 m</td>
<td>–</td>
<td>6 cm</td>
<td>Yes</td>
</tr>
<tr>
<td>K. L.</td>
<td>M</td>
<td>25</td>
<td>27</td>
<td>5 yrs 11 m</td>
<td>8 yrs</td>
<td>–</td>
<td>6 cm</td>
<td>Yes</td>
</tr>
</tbody>
</table>

---

**METHOD**

**Clinical Examination**

Besides the above-mentioned features being examined, the functional leg length difference was measured by placing plates under the foot of the operated leg until the anterior superior spines were horizontal.

---

**Table II. Detailed surgical procedures for each patient**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Osteotomy</th>
<th>Illipsoas</th>
<th>Hamstrings</th>
<th>Rectus femoris</th>
<th>Sartorius</th>
<th>Adductors</th>
<th>Glutei</th>
<th>Lig. sacro-tuberoso and sacro-spinalis</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. H.</td>
<td>Close to the symphysis. Just proximal to the ischial tuberosity. A few cm of the anterior part of the ischium is removed.</td>
<td>Blaces divided</td>
<td>Origins divided</td>
<td>Divided</td>
<td>Divided</td>
<td>Larger part released</td>
<td>Released</td>
<td>Divided</td>
</tr>
<tr>
<td>A. K.</td>
<td>In the symphysis. Through ilium, 1 cm proximal to the acetabulum, dorsally towards the ischial tuberosity. In the symphysis. At the inferior ischia.</td>
<td>Suture to the anterior superior spine</td>
<td>Decorticated from the ischial tuberosity</td>
<td>Suture to the anterior superior spine</td>
<td>Suture to the anterior superior spine</td>
<td>Divided medially</td>
<td>Ala ossis ili dissected free. Suture to the extensor-nerve</td>
<td>Divided</td>
</tr>
<tr>
<td>K. S.</td>
<td>Blaces and illipsoas divided</td>
<td>Released</td>
<td>Origin divided</td>
<td>Origin divided</td>
<td>Divided at insertions</td>
<td>Released</td>
<td>Divided</td>
<td></td>
</tr>
<tr>
<td>D. K.</td>
<td>Three cm proximal to the acetabulum. Incuera sphenoidal s dissected free. Through the psoas divided. Just proximal to the acetabulum</td>
<td>Released bluntly</td>
<td>Replaced</td>
<td>Released</td>
<td>Released</td>
<td>Released from ala ossis ili</td>
<td>Lig. saccro-tuberoso and sacro-spinalis</td>
<td>Divided</td>
</tr>
<tr>
<td>K. L.</td>
<td>Through the iliacus divided. Just proximal to the iliacus</td>
<td>Origins divided</td>
<td>Released</td>
<td>Released</td>
<td>In- and outside of ala dissected free</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No detailed report in the muscular reconstruction.
movements of the upper extremities, partly on an
electronic walkway as described by Rydell (6).
The calculations were made on the curve that best represented
the way of walking corresponding to the normal way.

Time
The time of single limb support (swing phase of the oppo-
site leg) was noted. The ratio was calculated between the
mean of the single limb supports of the operated and the
non-operated leg, as a measure of the weight bearing time of
the operated leg.

Maximum weight bearing
The maximum load put on the operated leg during single
limb support (the maximum vertical force) was defined as
a line from the base line to the highest peak of the stance-
phase curve. The line was measured in mm. The ratio was
calculated between the means of the amplitudes of the
operated and the non-operated leg during single limb sup-
port as a measure of the maximum weight bearing of the
operated leg (Fig. 3).

Step frequency
Step frequency (cadence) was controlled and determined with
the help of a stop watch and calculated from the
curve. The walking distance was doubled to 10 m in order
to obtain more reliable values.

One of the prerequisites in modern gait analysis is the
estimation of step length and gait velocity (as described by
Lamond and Todd (2)), which was measured in the pres-
ent examination as an additional procedure. Step length
was measured by letting the patient step on a stamp pad
and the distance between the first and the last heel print on
a 5 m distance was divided by the number of steps. Gait
velocity was calculated by a stop watch on a 10 m distance
and was registered in meters per second.

Muscle Force Analysis
The maximum isometric strength in flexion, extension and
abduction of the hip was measured with the Cybex II
isokinetic dynamometer (Lumex, New York). The muscle
torque produced was registered with strain gauges on the
lever arm register by a Gould Brook 220 recorder
(Gould Inc. Instrument Systems Division, Cleveland, Ohio).
The method was described by Hillsop & Perrine (1) and
by McFarland et al. 4.

The ratio in per cent between the maximum torque (Nm)
of the operated and the non-operated hip was used as a
measurement of the strength of the operated hip. The
strength in flexion and extension was measured in 45° of
flexion and without support for the foot. The strength in
abduction was measured in the neutral position and also in
the supine position, as the patients had difficulties abduct-
ing the leg against gravity. The patients were instructed to
avoid outward rotation of the hip when testing flexion and
abduction strength.

The aim was to prepare optimal conditions for activity
from the iliofemoral and gluteus medius, respectively. Mark-
ham (3) has made measurements of hip abduction in the
Cyber II. In our previous examination the axis of rotation
of the apparatus was not consistent with the hip joint,
and registration was made of both uni- and bilateral abduc-
tion. In the present examination the method has been
further developed in so far as the table and a special
construction on the resisting arm have been arranged,
so that the axis of rotation of the apparatus lies under
that of the hip joint. Only unilateral abduction was tested
and the pelvis was fixed. Though the methods were not
alike, there was a good conformity between them.

Table III. Walking ability

<table>
<thead>
<tr>
<th>Patient</th>
<th>No.</th>
<th>Maximum walking distance</th>
<th>Walking aid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>P. H.</td>
<td>2</td>
<td>500 m</td>
<td>2 crutches</td>
</tr>
<tr>
<td>A. K.</td>
<td>3</td>
<td>120 m</td>
<td>2 crutches</td>
</tr>
<tr>
<td>K. S.</td>
<td>4</td>
<td>Unlimited</td>
<td>None</td>
</tr>
<tr>
<td>D. K.</td>
<td>5</td>
<td>Unlimited</td>
<td>1 crutch</td>
</tr>
<tr>
<td>K. L.</td>
<td>6</td>
<td>Unlimited</td>
<td>1 crutch</td>
</tr>
</tbody>
</table>

1=examination, previous study 1980.
II=examination, present study 1982.
* = mobility, no change I/II.

I=examination, previous study 1980.
II=examination, present study 1982.

Summary of Additional Factors Studied at the Present Examination

As the aim of the present examination was to illustrate more clearly what the surgical procedure could permit,
concerning function, special parts have been added or extended as follows:
1. More comprehensive questions have been asked concerning
(a) pain    (b) leisure activity
(b) pain    (c) technical aids
(c) pain    (d) ability to ride a bicycle and climb stairs.
2. Passive range of hip rotation has been tested.
3. Active range of motion of the hip has been measured in
greater detail.
4. A further development of measuring the hip abductor
force has been undertaken.
5. Step frequency has been tested with a stop watch over a
doubled walking distance.
6. Step length and gait velocity have been recorded.

RESULT

Clinical examination (Table III-V)
No patient complained of pain in the hip region, but
discomfort of short duration occurred after strain.
All patients considered their maximum walking distance
to be satisfactory (Table III).

Case histories

One patient (P. H.) was retired and had had several
myocardial infarctions, but worked every day in his car-
penter's workshop—he saved, carried firewood and had
even climbed the roof to mend a hole. He used a pair of
reacher tongs and a glider chair and did not think that
he had improved since the previous examination. He could
not ride a bicycle, but managed stair climbing in the

normal way, i.e. putting one leg in front of the other.
A female patient (A. K.) was also retired but worked
every day at her loom. She devoted herself to active club
work and sometimes on these occasions used a wheel
chair. She could manage neither bicycling nor normal stair
climbing. Four hours a week she got household help for
household chores, shopping, and laundry. She still noticed
some improvement.

Another patient (K. S.) was a full-time musician, sitting
or standing for hours playing the double bass. His occu-
pancy required that he travel every week to engagements.
He was very active in his spare time and had arranged to
train bicycling indoors on the racing bicycle that he
otherwise used for transportation. Every day he carried
out an advanced strengthening program, climbed stairs
two steps at a time and could squat several hundred
metres at a time. During winter he could use social trans-
portation for the handicapped. He too noticed improve-
ment.

One patient (D. K.) was a full-time business man, who
did a lot of travelling. He exercised every day on his

Scand J Rehab Med 16
movements of the upper extremities, partly on an
electric walk-way as described by Rydlow (6).

The walking distance was doubled to 10 m in order
to obtain more reliable values.

One of the prerequisites in modern gait analysis is
the estimation of step length and gait velocity (as
described by L бумшчн и Todd (2)), which was made in the present
examination as an additional procedure. Step length
was measured by letting the patient step on a stamp pad
and the distance between the first and the last heel print on
a 1.5 m distance was divided by the number of steps. Gait
velocity was calculated by a stop watch on a 10 m distance
and was registered in meters per second.

Muscle Force Analysis
The maximum isometric strength in flexion, extension
and abduction of the hip was measured with the Cybex II
isometric dynamometer (Lusen, New York). The muscle
torque produced was registered with strain gauges on
the lever arm as registered by a Gould Brook 220 recorder
(Gould Inc. Instrument Systems Division, Cleveland, Ohio).
The method was described by Hidup & Percine (1)
and by Mooff et al. (4). The ratio in percent between the
maximum torque (Nm) of the operated and the non-operated hip was used as
a measurement of the strength of the operated hip. The
strength in flexion and extension was measured in 45°
of flexion and without support for the foot. The strength in abduction was measured in the neutral position and also in
the supine position, as the patients had difficulties abducting
the leg against gravity. The patients were instructed to
avoid outward rotation of the hip when testing flexion and
abduction strength.

The aim was to prepare optimal conditions for activity
from the iliacus and gluteus medius, respectively. Mark
(3) has made measurements of hip abduction in the
Cybex II. In our previous examination the axis of
rotation of the apparatus was outside of the hip joint,
and registration was made of both uni- and bilateral abduction.
In the present examination the method has been
further developed to use the table and a special
construction on the resisting arm have been arranged,
so that the axis of rotation of the apparatus lies under
that of the hip joint. Only unilateral abduction was tested
and the pelvis was fixed. Though the methods were not
alike, there was a good conformity between them.

**Table III. Walking ability**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Maximum walking distance</th>
<th>Walking aid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>P. H.</td>
<td>2</td>
<td>500 m</td>
</tr>
<tr>
<td>A. K.</td>
<td>3</td>
<td>1150</td>
</tr>
<tr>
<td>K. S.</td>
<td>4</td>
<td>Unlimited</td>
</tr>
<tr>
<td>D. K.</td>
<td>5</td>
<td>Unlimited</td>
</tr>
<tr>
<td>K. L.</td>
<td>6</td>
<td>Unlimited</td>
</tr>
</tbody>
</table>

1=examination 1, previous study 1980.
2=examination 2, present study 1982.

**Table IV. Range of passive hip motion**

<table>
<thead>
<tr>
<th>Flexion</th>
<th>Extension</th>
<th>Abduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Op</td>
<td>Non-op</td>
<td>Op</td>
</tr>
<tr>
<td>I</td>
<td>II</td>
<td>I</td>
</tr>
<tr>
<td>P. H.</td>
<td>70°</td>
<td>70°</td>
</tr>
<tr>
<td>A. K.</td>
<td>3</td>
<td>115°</td>
</tr>
<tr>
<td>K. S.</td>
<td>4</td>
<td>90°</td>
</tr>
<tr>
<td>D. K.</td>
<td>5</td>
<td>90°</td>
</tr>
<tr>
<td>K. L.</td>
<td>6</td>
<td>90°</td>
</tr>
</tbody>
</table>

1=examination 1, previous study 1980.
2=examination 2, present study 1982.

**Leg function after extraposition of acetabular ring**

<table>
<thead>
<tr>
<th>Summary of Additional Factors Studied at the Present Examination</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>As the aim of the present examination was to illustrate more clearly what the surgical procedure could permit, concerning function, special parts have been added or extended as follows:</td>
<td></td>
</tr>
<tr>
<td>1. More comprehensive questions have been asked concerning:</td>
<td></td>
</tr>
<tr>
<td>(a) pain</td>
<td></td>
</tr>
<tr>
<td>(b) leisure activity</td>
<td></td>
</tr>
<tr>
<td>(c) technical aids</td>
<td></td>
</tr>
<tr>
<td>(d) ability to ride a bicycle and climb stairs.</td>
<td></td>
</tr>
<tr>
<td>2. Passive range of hip rotation has been tested.</td>
<td></td>
</tr>
<tr>
<td>3. Active range of motion of the hip has been measured in greater detail.</td>
<td></td>
</tr>
<tr>
<td>4. A further development of measuring the hip abductor force has been undertaken.</td>
<td></td>
</tr>
<tr>
<td>5. Step frequency has been tested with a stop watch over a doubled walking distance.</td>
<td></td>
</tr>
<tr>
<td>6. Step length and gait velocity have been recorded.</td>
<td></td>
</tr>
</tbody>
</table>

**RESULT**

**Clinical examination (Table III-V)**

No patient complained of pain in the hip region, but discomfort of short duration occurred after strain. All patients considered their maximum walking distance to be satisfactory (Table III).

**Case histories**

One patient (P. H.) was retired and had had several myocardial infarctions, but worked every day in his carpenter's workshop—he used, carried firewood and had even climbed the roof to mend a hole. He used a pair of reacher tongs and a glider chair and did not think that he had improved since the previous examination. He could not ride a bicycle, but managed stair climbing in the normal way, i.e., putting one leg in front of the other. A female patient (A. K.) was also retired but worked every day at her loom. She devoted herself to active club work and sometimes on these occasions used a wheel chair. She could manage neither bicycling nor normal stair climbing. Four hours a week she got household help for household chores, shopping, and laundry. She still noticed some improvement. Another patient (K. S.) was a full-time musician, sitting or standing for hours playing the double bass. His occupation required that he travel every week to engagements. He was very active in his spare time and had arranged to train bicycling indoors on the racing bicycle that he otherwise used for transportation. Every day he carried out an advanced strengthening program, climbed stairs two steps at a time and could wind several hundred metres at a time. During winter he could use social transportation for the handicapped. He too noticed improvement.

One patient (D. K.) was a full-time business man, who did a lot of travelling. He exercised every day on his

Scand J Rehab Med 16
bicycle ergometer and managed stair climbing normally. He used a cane, but had not noticed any improvement since the previous examination. One day each week-end he stayed in bed for psychological reasons.

One patient (K. L.) was a full-time engineer. In his spare time he was a cycling enthusiast. He then moved in a jumping, limping but “distance gaining” way of running. He climbed the stairs in a normal way, used no technical aids and considered his hip to be still improving, especially after abandoning the cane. He could not ride a bicycle due to limited ability to bend the knee after a fracture of the patella.

Work capacity

All in all, the same activities were retained but with an improved capacity compared with the previous examination.

Leg length difference

Leg length difference was unchanged compared with the previous examination.

Table VI. Gait analysis

<table>
<thead>
<tr>
<th>Patient</th>
<th>No.</th>
<th>Walking aid</th>
<th>Time (s/100)</th>
<th>Load (s/100)</th>
<th>%body weight on up. limb</th>
<th>Ability to walk without aid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>I</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. H.</td>
<td>2</td>
<td>1 crutch</td>
<td>0.73</td>
<td>0.94</td>
<td>0.77</td>
<td>0.79</td>
</tr>
<tr>
<td>A. K.</td>
<td>3</td>
<td>2 crutches</td>
<td>0.72</td>
<td>0.72</td>
<td>0.25</td>
<td>0.15</td>
</tr>
<tr>
<td>K. K.</td>
<td>4</td>
<td>1 crutch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K. S.</td>
<td>5</td>
<td>1 crutch</td>
<td>0.92</td>
<td>0.88</td>
<td>0.78</td>
<td>0.81</td>
</tr>
<tr>
<td>K. L.</td>
<td>6</td>
<td>1 crutch</td>
<td>0.98</td>
<td>0.92</td>
<td>0.55</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Active range of motion

The passive range of motion is shown in Table IV. All patients had for their age a normal range on the non-operated side. After the operation, flexion had decreased compared with the non-operated side in all patients. Three patients (P. H., D. K. and K. L.) could not extend flexion 0°, but enough to sit comfortably. In one patient (P. H.) extension was unchanged, but otherwise increased and in one (A. K.) reached 20°. The changes in abduction vis-à-vis the non-operated side were negligible except in one patient (A. K.) who had increased 20°.

Adduction was increased in all patients on the operated side, but not registered, as it was impossible to determine when pelvic movement had started.

Outward rotation was in every case except one (K. L.) increased on the operated side. One patient (A. K.) had developed an abnormally large range of motion.

Inward rotation was reduced in 3 patients (P. H., K. S., and K. L.), one of whom (P. H.) had an outward rotation contracture of 20°. In 2 patients (A. K., D. K.) inward rotation had increased and in one (A. K.) reached 90°.

Compared with measuring the passive range of motion at the previous examination, one patient (K. S.) had an increased flexion and abduction, one patient (K. L.) had full extension but reduced abduction, and one (A. K.) reduced flexion and increased abduction.

Range of motion of the knee was normal with the exception of 2 patients (A. K. and K. L.) who had certain limitations due to fracture of the tibia and patella respectively.

Active range of motion (Table V)

Case: Four patients (P. H., K. S., D. K. and K. L.) could lift the operated leg from a supine position. Three of them (P. H., K. S., and K. L.) did so by lifting the pelvis and bracing the non-operated leg against the table. However, no flexion of the hip was noticed. The leg hung rather in the soft tissues of the hip. One patient (D. K.) showed a marked outward rotation of the hip and a visible contraction of the rectus femoris and tensor fasciae latae. Only one patient (K. S.) could carry out straight leg raising to 30° flexion.

One patient (A. K.) could not lift her leg from the table. All patients were able to clear the floor from the ground when standing. One patient (A. K.) did so by bending the knee and in doing this the hip was momentarily flexed a little, while the rest of the patients lifted the foot with some kind of active hip flexion.

Extension. Hip extension in the lateral position from 30° flexion with flexed knee in order to test the gluteus maximus muscle could be carried out by all patients except one (A. K.). One patient (K. S.) was the only one, who could extend the operated leg from the prone position, i.e. against gravity.

Abduction. Abduction by the gluteus medius, i.e. supine with the hip straight and not outwardly rotated, could be done by 2 patients (K. S., K. L.). Two patients (P. H., D. K.) performed the abduction test with the hip in marked outward rotation and with visible contraction of the rectus and the tensor. Only one patient (A. K.) could abduct the leg from the lateral position with a clear both visible and palpable contraction of the gluteus medius. One patient (A. K.) was not able to do an abduction.

Active range of motion in adduction and rotation was not tested, as it was considered less important.

Trendelenburg's test was in all cases positive as in the previous examination.

Table VII. Muscle force analysis in "Cyberc II"

<table>
<thead>
<tr>
<th>Patient</th>
<th>No.</th>
<th>Flexion</th>
<th>Extension</th>
<th>Abduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
<td>II</td>
<td>I</td>
</tr>
<tr>
<td>P. H.</td>
<td>2</td>
<td>15%</td>
<td>20%</td>
<td>68%</td>
</tr>
<tr>
<td>A. K.</td>
<td>3</td>
<td>Cannot</td>
<td>65%</td>
<td>59%</td>
</tr>
<tr>
<td>K. S.</td>
<td>4</td>
<td>33%</td>
<td>28%</td>
<td>90%</td>
</tr>
<tr>
<td>D. K.</td>
<td>5</td>
<td>48%</td>
<td>51%</td>
<td>86%</td>
</tr>
<tr>
<td>K. L.</td>
<td>6</td>
<td>14%</td>
<td>5%</td>
<td>77%</td>
</tr>
</tbody>
</table>

Adduction and rotation not tested.

*Examination 1, previous study 1980.
**Examination 2, present study 1982.

* Not according to instruction.
bicycle ergometer and managed stair climbing normally. He used a cane, but had not noticed any improvement since the previous examination. One day each week-end he stayed in bed for psychological reasons.

One patient (K. L.) was a full-time engineer. In his spare time he was a football enthusiast. He then moved in a jumping, limping but “distance gaining” way of running. He climbed the stairs in a normal way, used no technical aids and considered his hip to be still improving, especially after abandoning the cane. He could not ride a bicycle due to limited ability to bend the knee after a fracture of the patella.

Work capacity

All in all, the same activities were retained but with an improved capacity compared with the previous examination.

Leg length difference

Leg length difference was unchanged compared with the previous examination.

Table VI. Gait analysis

<table>
<thead>
<tr>
<th>Patient</th>
<th>No.</th>
<th>Walking aid</th>
<th>Time (s/step)</th>
<th>Load (s/step)</th>
<th>%body weight on opp. limb</th>
<th>Ability to walk without walking aid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td></td>
<td>I II</td>
<td>I II</td>
<td></td>
<td>I II</td>
</tr>
<tr>
<td>P. H.</td>
<td>2</td>
<td>1 crutch</td>
<td>0.73 0.94</td>
<td>0.77 0.79</td>
<td>77% 68%</td>
<td>Cannot</td>
</tr>
<tr>
<td>A. K.</td>
<td>3</td>
<td>2 crutches</td>
<td>0.72 0.72</td>
<td>0.25 0.15</td>
<td>25% 16%</td>
<td>Cannot</td>
</tr>
<tr>
<td>K. L.</td>
<td>6</td>
<td>1 crutch</td>
<td>0.93 0.92</td>
<td>0.55 0.76</td>
<td>75% 80%</td>
<td>Cannot</td>
</tr>
<tr>
<td>K. S.</td>
<td>5</td>
<td>None</td>
<td>0.73 0.87</td>
<td>1.00 0.88</td>
<td>100% 100%</td>
<td>Cannot</td>
</tr>
<tr>
<td>K. S.</td>
<td>4</td>
<td>None</td>
<td>0.92 0.92</td>
<td>0.78 0.81</td>
<td>78% 78%</td>
<td>Cannot</td>
</tr>
<tr>
<td>A. K.</td>
<td>2</td>
<td>None</td>
<td>0.89 0.77</td>
<td>0.99 1.00</td>
<td>100% 100%</td>
<td>Cannot</td>
</tr>
</tbody>
</table>

Table VII. Muscle force analysis in “Cyber 3”

<table>
<thead>
<tr>
<th>Patient</th>
<th>No.</th>
<th>Flexion</th>
<th>Extension</th>
<th>Abduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I II I I</td>
<td>I II I I</td>
<td>I II I I</td>
</tr>
<tr>
<td>P. H.</td>
<td>2</td>
<td>15% 20%</td>
<td>68% 68%</td>
<td>52% 52%</td>
</tr>
<tr>
<td>A. K.</td>
<td>3</td>
<td>Cannot</td>
<td>Cannot</td>
<td>Cannot</td>
</tr>
<tr>
<td>K. S.</td>
<td>4</td>
<td>33% 28%</td>
<td>90% 90%</td>
<td>116% 116%</td>
</tr>
<tr>
<td>D. K.</td>
<td>5</td>
<td>48% 51%</td>
<td>86% 86%</td>
<td>71% 71%</td>
</tr>
<tr>
<td>K. L.</td>
<td>6</td>
<td>14% 5%</td>
<td>77% 77%</td>
<td>97% 97%</td>
</tr>
</tbody>
</table>

Adduction and rotation not tested.

(A. K.) had developed an abnormally large range of motion.

Passive range of motion is shown in Table IV. All patients had for their age a normal range on the non-operated side. After the operation, flexion had decreased compared with the non-operated side in all patients. Three patients (P. H., D. K. and K. L.) could not flex to 90°, but enough to sit comfortably. In one patient (P. H.) extension was unchanged, but otherwise increased and in one (A. K.) reached to 20°. The differences in abduction vis-à-vis the non-operated side were negligible except in one patient (A. K.) who had increased 20°.

Adduction was increased in all patients on the operated side, but not registered, as it was impossible to determine when pelvic movement had started.

Outward rotation was in every case except one (K. L.) increased on the operated side. One patient (A. K.) could lift the operated leg from a supine position. Three of them (P. H., D. K. and K. L.) did so by lifting the pelvis and bracing the non-operated leg against the table. However, no flexion of the hip was noticed. The leg hung rather in the soft tissues of the hip. One patient (D. K.) showed a marked outward rotation of the hip and a visible contraction of the rectus femoris and tensor fasciae latae. Only one patient (K. S.) could carry out straight leg raising to 30° flexion.

One patient (A. K.) could not lift his leg from the table. All patients were able to clear the foot from the ground when standing. One patient (A. K.) did so by bending the knee and in doing this the hip was momentarily flexed a little, while the rest of the patients lifted the foot with some kind of active hip flexion.

Extension. Hip extension in the lateral position from 30° flexion with flexed knee in order to test the gluteus maximus muscle could be carried out by all patients except one (A. K.). One patient (K. S.) was the only one, who could extend the operated leg from the prone position, i.e. against gravity.

Abduction. Abduction by the glutus medius, i.e. supine with the hip straight and not outwardly rotated, could be done by two patients (K. S., K. L.). Two patients (P. H., D. K.) performed the abduction test with the hip in marked outward rotation and with visible contraction of the rectus and the tensor. Only one patient (K. S.) could abduct the leg from the lateral position with a clear both visible and palpable contraction of the glutus medius. One patient (A. K.) was not able to do an abduction.

Active range of motion in adduction and rotation was not tested, as it was considered less important.

Trendelenburg’s test was in all cases positive as in the previous examination.

Leg function after extirpation of acetabular ring
Gait analysis (Table VI)

In comparison with the previous examination 2 patients (K. S., K. L.) gave the impression of having improved their gait considerably. This was also confirmed by the analyses of the gait. The other three seemed to walk as well as 2 years previously which was confirmed by the recordings from the walk-way concerning 2 patients (P. H., D. K.). One patient (A. K.), however, showed over all less good results.

One patient (P. H.), who walked normally with two crotches at the previous examination, but also managed a test with only one used crotch normally this time. A comparison of registration curves showed that the ratio between the operated and the non-operated leg concerning time of weight bearing on the single limb support had increased from 0.73 to 0.94. Weight bearing on the operated leg as a percentage of body weight had decreased from 77% to 68%. Step frequency was almost unchanged, 75 compared with 74 steps/min. Step length was 61 cm and gait velocity 0.798 m/sec. The patient’s heart insufficiency was the reason for the limitation in walking distance.

One patient (A. K.) could only walk with two crotches at the previous examination. This time recordings were made with both one and two crotches. She could not walk without aid. A comparison between the recordings with two crotches shows that the ratio between the time of weight bearing of the operated and non-operated leg was almost equal, 0.73 and 0.72. On the other hand, the operated leg took only 156% of the body weight, implying a very little load on the hip, compared with 25% at the previous examination. Step frequency calculated from the curve was at the previous examination 66 steps/min and now 56 steps/min but the calculation of step frequency most of the time for this patient was 56 steps/min and gait velocity 1.067 m/sec at the present examination. In all cases the patient was walking without support, showed an increase from 0.98 to 0.97 concerning the ratio of weight bearing between the legs. Step frequency had increased from 70 to 80 steps/min. Step length increased from 43 to 53 cm and gait velocity 0.877 m/sec at the present examination. This patient was considered to demonstrate no change.

One patient (K. L.) walked at the previous examination with a crotch, but was able to walk short distances without it. At the present examination he normally walked without any kind of aid. Registrations were made at both times with and without a crotch.

Crutch walking gave very similar recordings, besides step frequency having increased from 70 to 84 steps/min. Walking without support showed an increase from 0.98 to 0.97 concerning the ratio of weight bearing between the legs. Step frequency had increased from 70 to 86 steps/min. Step length increased from 43 to 53 cm and gait velocity 0.877 m/sec at the present examination.

DISCUSSION

The usual operative treatment of chondrosarcoma of the pelvis is hemipelvectomy. However, in 4 of 7 cases the tumor was radically included including the acetabulum but preserving the lig. Besides a preliminary report (5) little has been published on the surgical procedure and postoperative funk with special regard to gait and muscle force. Marked (3) has used the isokinetic dynamometer to record muscle force in patients with cancer of the acetabulum.

It is of interest to see, if any change had occurred two years after a previous investigation. It is of particular interest in that the operated leg did not have a greater length than the non-operated leg. The general impression was that the operated leg had a slightly shorter length than the non-operated leg.

Adduction: One patient (K. L.) had increased 12%, 2 patients (A. K., K. S.) had decreased 2% and 8%, respectively, and 2 patients (P. H., D. K.) had decreased between 6-16%. Adduction: One patient (K. L.) had increased 12%, 2 patients (A. K., K. S.) had decreased 2% and 8%, respectively, and 2 patients (P. H., D. K.) had decreased between 6-16%.

Adduction and rotation were not tested due to lack of equipment.

One patient (P. H.) had an outward rotation contracure of the hip that caused problems in carrying out the flexion and abduction tests according to instruction. In both cases the lateral hip flexors, i.e. the rectus femoris and tensor fasciae latae were visibly active. Extension strength at the previous examination was 68% and now 59%. One patient (A. K.), however, showed an increase on any occasion flex the hip. Extension was earlier 65% and now 59%. Abduction strength was 30 and 33%, respectively. No great difference existed compared with the previous testing. One patient (K. S.) flexed his hip with 33% of the hip flexion strength of the non-operated hip at the previous examination and with 28% at the present one. Extension strength had increased from 40 to 116%. The results from the recordings of abduction strength were 63 and 55% a decrease since the previous examination.

One patient (D. K.) compensated his weakness of the hip flexors and glutes medius by outwardly rotating his hip using the lateral hip flexors to flex and abduction. Extension strength was earlier 86% and at the present examination 91%.

The flexion strength of one patient (K. L.) was earlier 45% compared with 5% now. According to the examiner’s judgement, the difference was not due to a deterioration, but the patient had instead in a better way followed instructions at the present examination. Extension strength increased from 77 to 97% and abduction strength from 36 to 48%.

Leg function after excision of acetabular ring

All patients had a satisfactory range of hip motion, that had increased in all cases since the previous examination. This was not accompanied by any noteworthy increase in function except in one patient (K. L.), who got rid of a flexion contracture. One patient (A. K.) had an abnormally large range of motion and also less impressive results in all other tests, which shows that good range of motion does not mean good function unless accompanied by muscular control.

Gait

Two patients (K. S., K. L.) had markedly improved their gait. One (K. S.) had a less pronounced Trendelenburg limp when walking with the same step frequency as at the first examination, but had chosen to increase his normal gait velocity in spite of the more pronounced limp that then occurred. The other patient (K. L.) had let go of his cane, even though his limp became more obvious than. Both patients had markedly improved in weight bear and step frequency. One patient (P. H.) had let go of one cane, but otherwise did not show any change. The other patient had not changed their gait.

As step length was measured only at the present examination, gait velocity could not be compared between the examinations. The two young men (K. S., K. L.) had a faster normal gait than the two older men (P. H., D. K.) who had a functionally satisfactory gait velocity, while one patient (A. K.) walked slowly and cautiously. The three older patients thought, that too much weight bearing was bad for the hip. The development of a new hip joint roof, a stronger glutes maximus muscle and by that an improved gait, might have improved the gait, if the patients had not had this opinion. It might seem remarkable, that one patient (A. K.) felt, that she still made progress, when her test results showed the opposite. The reason might be that adaptation to the situation and an improved compensatory technique did not show in the objective test results.

Muscle force analysis

Differences less than 15% may be regarded as muscle force of equal value.
Leg function after extirpation of acetabular ring

In all it may be said, that improvement in muscular function seemed to be related to age with younger individuals improving more than older.

Passive range of motion

All patients had a satisfactory range of hip motion, that had increased in all cases since the previous examination. This was not accompanied by any noteworthy increase in function except in one patient (K. L.), who got rid of a flexion contracture. One patient (A. K.) had an abnormally large range of motion and also less impressive results in all other tests, which shows that good range of motion does not mean good function unless accompanied by muscular control.

Gait

Two patients (K. S., K. L.) had markedly improved their gait. One (K. S.) had a less pronounced Trendelenburg limp when walking with the same step frequency as at the first examination, but had chosen to increase his normal gait velocity in spite of the more pronounced limp that then occurred. The other patient (K. L.) had let go of his cane, even though his limp became more obvious then. Both patients had markedly improved in weight bearing and step frequency. One patient (P. H.) had let go of one cane, but otherwise did not show any change. The other patients had not changed their gait.

As step length was measured only at the present examination, gait velocity could not be compared between the examinations. The two young men (K. S., K. L.) had a faster normal gait than the two older men (P. H., D. K.) who had a functionally satisfactory gait velocity, while one patient (A. K.) walked slowly and cautiously. The three older patients thought, that too much weight bearing was bad for the hip. The development of a new hip joint roof, a stronger gluteus maximus muscle and by that an improved gait, might have improved the gait, if the patients had not had this opinion. It might seem remarkable, that one patient (A. K.) felt, that she still made progress, when her test results showed the opposite. The reason might be that adaptation to the situation and an improved compensatory technique did not show in the objective test results.

Muscle force analysis

Differences less than 15% may be regarded as muscle force of equal value.
Flexion. The demand for strength in hip flexion to manage the activities of daily living is not greater than that of lifting the foot up a step or a curb, while the range of hip flexion must be large, e.g. to be able to rise from a chair. The flexion force of the iliosprous muscle was very weak in all patients, which did not change between the examinations. This thought was to be due to the bad lever arm condition of the muscle being shortened as a result of the operation. Despite this weakness all patients except one could lift the foot up a step using the lateral hip flexors at the same time.

No great difference could be seen in flexion force since the first examination.

Extension. Of all tested muscles the gluteus maximus was the strongest in all patients. The muscle was not incised during the operation. One patient (K. L.) increased his strength from 90 to 116%, indicating that he was stronger on his operated side. Another patient (K. L.) had abandoned his cane, increased 20%, and was now almost as strong as on the non-operated side. Good hip extension strength was related to weight bearing on the operated leg and consequently also able to walk without a cane, to gait velocity and to maximal walking distance.

It was also obviously related to formation of a hip joint roof on the os ilium, to an intact femoral head and to young age. One patient (A. K.) who did not put any weight on his hip, walked with two crutches and had no hip joint roof or femoral head, consequently showed little strength in hip extension.

Abduction. All patients compensated for the bad lever arm condition of the gluteus medius by using the tensor fasciae latae and rectus femoris when trying to abduct. When instructed to use the gluteus medius in the supine position the torque was half of the torque of the non-operated side in the strongest patient (K. S.). This, however, was not sufficient to abduct the leg against gravity. On weight bearing, the bad lever arm condition grew even worse making it impossible to avoid a Trendelenburg gait. One patient (K. L.) showed an increase since the previous examination, which corresponded to his increase in weight bearing. The increase was less than 15%, but in this particular instance the increase was so marked in comparison with initial registrations, that it can still be regarded as a real and valid increase.

When, with regard to the tumour, surgery can be radical without necessarily depriving the patient of the lower limb, a satisfactory functional result can be expected. This material shows that though gait ability and hip muscle strength are reduced, function is surprisingly good many years after the operations. An important factor to consider is also the psychological advantages.

REFERENCES

2. Lamespou, L. W., & Todd, F. N.: The importance of time and distance measurements for analysis of human walking, Presented at World Congress of ISPO, INTEGRIS & APO, Montreal, Quebec, Canada, Oct 8-12, 1974.

Address for offprint:
Elisabeth Olsson
Department of Orthopaedic Surgery
Karolinska Hospital
S-171 76 Stockholm
Sweden


HALA-B27 AS A DIAGNOSTIC SCREENING TOOL IN CHRONIC LOW BACK PAIN

Johan Sandström, Gunnar B. J. Andersson and Leenart Rydberg

From the Department of Orthopaedic Surgery, Sahlgrenska Hospital, and the Blood Centre, Sahlgrenska Hospital, Göteborg, Sweden

ABSTRACT. Forty-five of 52 consecutive patients with chronic low back pain were screened for presence of HLA- B27 antigens one year after they were included in a rehabilitation program. Six (13.3%) were positive and, when re-examined radiographically, 2 had signs of ankylosing spondylitis. The proportion of antigen-positive individuals is similar to that found in a population study of healthy Swedish blood donors, and within the other populations of healthy controls. It is concluded that HLA-B27 is of limited diagnostic value as a screening test for ankylosing spondylitis in a patient group with chronic low back pain.

Key words. HLA-B27, ankylosing spondylitis, low back pain, prediction

Chronic low back pain is a common cause of functional limitation and disability, not infrequently leading to prolonged or permanent sickness absence from work. Being a symptom and not a disease, chronic low back pain can arise from several aetiologies. Degenerative changes are considered to be the most frequent cause, but chronic low back pain can sometimes indicate inflammatory disease. Back pain of inflammatory etiology can be difficult to diagnose, at least in the early stages. Great interest was therefore expressed when a statistically significant association was reported (1), that between ankylosing spondylitis (AS) and a histocompatibility complex antigen HLA-B27. Typing for HLA-B27 has thereafter been used as a diagnostic tool, but the clinical value of its use on a routine basis has been uncertain.

In recent years the association between HLA-B27 and AS has been clearly documented. The specificity is low, however, reducing the value of positive typing for screening purposes. Calin (2) found the sensitivity to predict ankylosing spondylitis from the presence of HLA-B27 to be 95%, whereas the specificity was only 20%. In 1979 Jaju (4) reported a surprisingly high percentage (42.4%) of HLA-B27-positive subjects in a series of patients with chronic low back pain, and concluded that the diagnostic value was significant. Some uncertainty arose from the fact, however, that Jaju's papers reported on patients from a rheumatology ward, where selection can have prevailed.

The purpose of the present study was to evaluate the diagnostic role of HLA-B27 in a group of patients with chronic low back pain, in which inflammatory disease was not clinically suspected on the basis of history, physical examination and radiographs.

PATIENTS AND METHODS

HLA-B27 typing was done on a group of patients, who formed part of a study material in which the purpose was to evaluate different prospective factors in patient rehabilitation. Typing was done at least 6 months after the onset of the main study in which 52 patients took part. The inclusion criteria in the study were that the subjects should have been off work for at least 3 months, be less than 50 years of age, and have no signs of root compression. Radiographs were taken of all patients before inclusion, and at that time showed no signs of AS. All patients were Caucasians. Data about their physical status, pain history and psychological and social status will be presented elsewhere. No signs of inflammatory disease were noted. All patients were asked to participate in the HLA-B27 screening. Seven chose not to. Of the remaining 45 patients, 29 were male, 16 female. The mean age was 41 years (range 28-51).

Histocompatibility antigens typing was performed using a standard microlymphocytotoxic technique (5). New reagent panels of the sacro-iliac joints and lumbar spine were taken in the patients shown to be HLA-B27 positive, about one year after the start of the study.

RESULTS

Six of the 45 patients were HLA-B27-positive (13.3%). Two of these patients had radiographic signs of AS at follow-up. One patient, a 49-year-