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Back pain and arthralgia before and after leg lengthening

75 patients questioned after 6 (1–11) years

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We performed 100 lengthenings of the lower extremities in 85 patients from 1980 to 1991, using three different surgical techniques. 6 (1–11) years after lengthening 75 of these patients with a preoperative leg length inequality of 6 (3–14) cm were clinically and radiographically assessed, and replied to a questionnaire on pre- and postoperative complaints of low back pain and pain from the joints of the lower extremities.

Patients 15 years of age or younger at surgery had few complaints. Before lengthening, 18 patients suffered from severe low back pain compared with 6 at follow-up. Complaints from the joints of the lower extremities were less common and the effect of lengthening on these symptoms was minor. The ability to work, walk and to perform recreational activities was improved. 60 patients were satisfied with the result of the lengthening.

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Few studies have analyzed the preoperative complaints associated with leg length inequality (LLI) and how these complaints are affected by leg lengthening (LL) (Pouliquen et al. 1989, Dutoit et al. 1990, Hrutkay et al. 1990). In this retrospective study we assessed the type and degree of subjective complaints experienced before and after LL and elucidated the patients' opinion of the outcome of the operation.

Patients and methods

100 lengthenings of the lower extremities were performed in 85 patients at our department between 1980 and 1991. 3 different surgical techniques were used (Table 1).

Direct lengthening (Merle d'Aubigné 1971, Tjernström et al. 1993) was used in 20 posttraumatic shortenings. The time from fracture to lengthening was 7 (1–19) years. Angular and/or rotational deformities, when present, were corrected simultaneously. Intramedullary nails or blade-plates were used. Wagner (1972) lengthening was performed untill 1984. 4 of these 24 patients were later re-lengthened with callus distraction. Callus distraction (Monticelli and Spinelli 1983, Ilizarov 1988, Aldegheri et al. 1989, Tjernström et al. 1994) was introduced in 1980 and is the technique we currently prefer.

All the patients received a questionnaire 6 (1–11) years after lengthening and were asked to evaluate their preoperative degree of low back pain (LBP), complaints/pain from the joints of the lower extremities and the degree of limping. The complaints were graded on a scale of 0–3 from no complaints to severe complaints. Walking ability, cosmetic appearance, working ability, recreational activity and range of motion (ROM) of knee and ankle after the lengthening procedure were assessed as impaired, unchanged or improved. The patients were also asked to state whether they were satisfied, uncertain or dissatisfied as regards the operative result. 10 patients were excluded (Table 2).

75 patients with a preoperative LLI of 6 (3–14) cm were reviewed (Table 1) and were clinically examined (ROM hip, knee and ankle joints). 3 patients declined radiographic examination (orthoradiographs, long-standing AP view of the lower extremities, sagittal projection of the lengthened segment and adjacent joints).

The Wilcoxon's signed rank test was used for paired comparisons and Mann-Whitney and Spearman rank correlation for unpaired comparisons.

Results

30 patients, 15 years of age or younger at surgery, had few complaints regarding LBP and the joints of

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Table 1. Total material reviewed. The table is arranged according to technique, segment, diagnosis and age

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN
1	13	2	8	1	1	1	2	9	0	15	2	0	0	1	2	0	0	0	1	0	0	0	2	0	1	1	0	0	3	3	3	2	3	2	2	2	2	2	3
2	15	1	8	2	1	1	1	6	3	17	2	3	4	0	1	2	0	0	0	0	0	0	1	2	3	2	1	0	3	2	3	3	2	2	2	2	1	2	3
3	20	2	9	2	1	1	1	7	2	22	2	2	2	1	3	0	0	0	0	0	0	0	0	0	3	1	1	0	4	3	3	2	2	2	1	1	2	2	3
4	24	2	4	1	1	1	1	4	0	25	1	0	2	1	3	2	0	0	0	0	0	0	0	0	3	0	0	0	4	2	2	3	3	2	1	2	2	2	3
5	5	2	4	1	1	2	1	4	1	9	4	3	2	0	0	1	0	2	0	1	0	0	0	0	3	2	1	0	3	3	3	3	3	2	2	2	2	2	3
6	12	1	4	2	1	2	1	3	2	16	4	2	3	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	3	3	3	3	3	2	2	2	2	2	3
7	13	2	5	1	1	2	1	5	0	21	8	5	6	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	4	2	2	2	2	2	2	2	2	2	3
8	13	2	6	1	1	2	2	7	0	14	1	0	1	0	1	0	0	0	0	0	0	0	0	0	3	2	1	0	3	2	3	2	2	2	2	2	2	2	3
9	14	1	5	1	1	2	1	5	1	20	6	0	1	1	2	2	0	0	0	0	0	0	0	0	2	1	0	0	4	3	3	1	2	2	2	2	2	2	3
10	14	2	5	1	1	2	2	5	0	17	3	3	2	1	2	0	0	0	0	0	2	0	2	0	3	0	0	0	3	2	2	2	2	2	2	2	1	1	3
11	16	2	8	2	1	2	1	8	0	19	3	1	1	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	3	2	3	3	2	2	2	2	2	2	3
12	17	2	6	1	1	2	2	5	1	22	5	2	2	0	2	0	0	0	2	0	2	1	0	0	0	0	0	0	4	3	3	2	3	2	2	2	2	1	3
13	17	1	8	2	1	2	2	8	1	19	2	2	1	1	2	0	0	0	0	0	0	0	0	0	1	2	1	0	3	3	3	3	3	2	2	2	3	2	3
14	15	1	5	3	1	1	1	5	0	17	2	0	1	1	1	3	0	0	1	0	0	0	2	2	2	1	1	0	3	2	3	2	3	2	2	2	2	2	3
15	15	1	9	3	1	1	1	9	0	18	3	0	1	1	1	0	1	0	1	1	0	0	0	0	3	1	1	0	3	3	3	3	3	2	2	2	2	2	3
16	19	1	4	3	1	1	2	4	0	21	2	0	1	1	3	2	0	0	0	0	0	0	0	0	0	2	1	0	4	3	3	1	3	2	2	2	2	2	3
17	21	2	6	3	1	1	1	5	0	22	1	0	1	1	1	0	1	0	0	0	0	0	0	1	2	2	0	0	4	2	3	2	2	2	2	2	2	2	3
18	21	2	8	3	1	1	1	5	0	22	1	1	2	1	3	0	1	0	2	0	0	0	2	0	3	1	0	0	4	3	3	3	3	2	1	1	2	2	3
19	22	1	4	3	1	1	2	4	0	27	5	0	0	1	2	0	2	1	2	0	2	1	0	0	0	0	1	0	4	3	3	1	3	2	3	2	3	2	1
20	22	2	6	3	1	1	2	6	1	23	1	2	2	1	2	2	1	1	3	3	0	0	3	3	3	3	1	1	4	1	2	1	1	2	1	1	2	2	2
21	22	1	8	3	1	1	1	8	1	23	1	2	3	0	0	0	0	0	0	0	0	0	0	2	3	0	1	1	2	3	3	3	3	2	2	2	2	2	3
22	24	2	7	3	1	1	2	5	1	30	6	0	1	0	1	1	0	0	2	2	0	0	2	2	2	1	1	0	4	3	3	1	2	2	1	1	2	2	1
23	33	2	3	3	1	1	2	3	0	36	3	0	1	1	3	3	3	0	1	0	3	2	2	0	3	0	1	0	2	3	3	1	3	2	3	2	3	2	3
24	36	1	4	3	1	1	1	4	1	37	1	1	0	1	3	0	0	0	0	0	0	0	0	0	2	0	0	0	4	3	3	2	3	2	2	2	2	2	3
25	43	1	4	3	1	1	1	4	0	44	1	0	1	1	1	0	0	0	2	0	0	0	3	0	2	0	1	0	4	2	3	3	3	2	3	3	3	2	3
26	18	1	4	3	1	2	1	4	0	19	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	1	2	1	2	1	2	2	2	1
27	26	2	5	3	1	2	2	4	0	27	1	0	1	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	4	2	3	2	2	2	3	2	1	2	3
28	36	1	6	3	1	2	2	6	0	40	4	0	1	1	3	0	0	0	0	0	2	2	0	0	2	0	1	0	4	2	3	3	3	2	2	2	1	2	3
29	8	2	5	4	1	1	1	6	2	11	3	2	5	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	3	3	3	1	3	2	2	2	2	2	3
30	10	1	6	4	1	1	2	6	0	15	5	0	6	0	0	0	0	0	0	0	0	0	3	0	3	0	1	0	3	3	3	3	3	2	3	2	3	2	3
31	26	1	7	4	1	1	2	7	0	31	5	0	0	1	2	0	2	0	0	0	0	3	0	0	2	0	1	0	2	2	3	3	1	2	1	1	2	2	3
32	6	2	14	5	1	1	2	14	0	9	3	4	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	3	3	2	3	2	3	2	3	2	3
33	14	2	5	6	1	1	2	4	1	16	2	2	1	0	0	0	0	0	0	0	0	0	0	0	2	2	1	0	3	2	2	2	2	2	2	2	2	2	3
34	7	1	10	7	1	1	1	8	2	18	11	5	6	0	0	0	0	0	0	1	0	0	0	1	3	2	1	1	3	3	3	1	3	1	2	2	2	2	2
35	12	1	8	10	1	1	2	6	1	22	10	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	2	3	3	2	2	1	2	2	2	3
36	15	1	7	11	1	1	2	7	1	17	2	1	1	0	1	1	0	0	0	0	3	1	3	2	3	1	1	0	3	3	3	3	3	2	3	3	3	2	3
37	11	1	3	4	1	2	2	3	1	14	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	2	3	3	3	2	2	2	2	2	3
38	13	1	5	5	1	2	2	5	0	20	7	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	3	1	1	1	1	2	1	1	1	2	2
39	13	1	6	6	1	2	1	6	0	14	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	2	3	2	1	2	1	1	1	1	3
40	26	2	11	7	1	2	2	10	1	27	1	1	2	1	3	1	0	0	0	0	0	0	2	2	3	0	1	0	4	2	3	3	2	2	2	2	1	1	3
41	18	1	3	3	2	1	2	3	0	25	7	0	0	1	3	1	2	0	0	0	0	0	0	0	3	0	0	0	4	3	3	1	3	2	2	2	2	2	3
42	20	2	6	3	2	1	1	3	0	26	6	0	0	0	0	2	2	1	2	1	1	1	2	2	3	3	1	0	4	3	3	3	2	2	2	2	2	2	3
43	20	1	4	3	2	1	1	3	2	24	4	2	1	1	3	2	0	0	0	0	0	0	2	0	3	1	1	1	4	3	3	3	3	2	3	2	3	2	3
44	21	1	4	3	2	1	1	4	1	29	8	0	0	1	2	2	0	0	1	0	0	0	2	1	3	0	1	0	4	3	3	3	3	2	2	2	2	2	3
45	23	2	8	3	2	1	1	5	3	30	7	2	3	1	2	2	0	2	3	2	0	3	2	2	3	2	1	0	2	1	1	1	1	1	1	1	1	1	1
46	24	2	3	3	2	1	1	2	1	34	10	2	0	0	0	2	0	0	3	2	3	3	3	2	0	0	0	1	1	1	1	1	1	2	1	2	1	2	3
47	28	2	3	3	2	1	2	3	0	35	7	0	0	1	2	1	0	1	3	1	2	1	3	1	3	2	0	0	4	1	1	1	1	1	1	2	1	1	2
48	29	2	9	3	2	1	2	4	5	36	7	5	5	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	4	3	3	2	2	2	2	2	2	2	1
49	29	1	3	3	2	1	2	1	2	36	7	2	3	1	3	2	1	0	3	0	0	0	2	2	2	1	1	0	4	2	3	3	3	2	2	3	2	2	3
50	30	2	7	3	2	1	2	4	2	38	8	2	2	1	3	3	2	3	3	2	2	2	2	2	3	2	1	1	2	2	2	1	2	2	2	2	1	1	3
51	39	2	4	3	2	1	1	3	1	48	9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	2	3	3	2	2	2	2	2	2	3
52	44	2	5	3	2	1	2	3	2	46	2	2	3	1	1	2	3	3	0	1	0	0	3	3	3	3	1	0	1	1	1	1	1	2	3	2	3	2	3
53	47	2	8	3	2	1	2	6	2	57	10	2	5	1	1	3	1	1	2	3	1	1	3	3	3	3	1	1	4	3	3	3	3	2	2	2	2	2	3
54	50	2	6	3	2	1	1	4	3	59	9	2	4	1	2	1	0	0	2	1	0	0	3	0	3	1	1	0	1	3	3	3	2	2	3	2	3	2	3
55	55	1	3	3	2	1	1	2	2	63	8	2	1	0	0	2	0	0	3	3	0	0	0	0	0	2	1	1	1	3	3	3	3	2	3	2	3	2	2
56	16	1	3	3	2	2	2	2	0	19	3	2	2	1	2	1	0	0	3	1	1	0	1	1	3	1	1	0	3	3	3	1	3	2	1	2	3	2	3
57	54	1	4	3	2	2	2	2	2	61	7	2	X	1	2	2	0	0	0	0	0	0	0	0	3	0	0	0	2	3	3	3	3	2	2	2	2	2	3
58	6	1	4	1	3	1	2	4	1	16	10	2	3	0	2	1	2	0	0	0	0	2	2	2	0	0	1	0	3	3	3	3	3	2	3	2	1	2	3
59	9	2	6	1	3	1	1	6	0	20	11	0	1	0	0	0	0	0	0	0	3	0	3	3	3	2	1	0	4	2	3	1	3	2	2	2	2	2	2
60	12	2	6	1	3	1	2	8	1	20	8	2	1	0	1	1	0	0	0	0	0	0	2	1	0	0	1	1	4	2	3	2	2	2	2	2	2	2	3
61	13	1	11	1	3	1	2	4	6	24	11	10	10	0	0	0	0	0	0	2	0	0	0	0	0	0	1	1	4	1	1	1	1	2	1	2	1	1	2
62	17	2	3	3	3	1	1	2	1	24	7	0	1	1	2	0	0	0	0	0	0	0	0	3	1	0	0	0	4	2	3	1	2	2	2	2	2	2	2
63	17	2	4	3	3	1	2	4	0	26	9	0	0	1	3	2	2	2	0	1	1	1	1	0	0	0	1	0	4	3	3	3	3	2	3	2	3	2	3
64	20	2	8	3	3	1	1	9	0	28	8	0	X	1	0	0	0	0	0	0	0	0	0	0	3	0	0	0	4	2	2	3	2	2	1	1	2	2	3
65	23	1	4	3	3	1	2	5	1	33	10	1	0	1	3	2	3	0	3	1	0	0	0	0	3	0	1	0	4	3	3	3	3	2	2	2	2	2	3
66	25	2	8	3	3	1	2	9	0	36	11	1	2	1	3	2	2	1	3	2	2	1	3	2	3	1	1	0	4	3	3	3	3	2	2	2	2	2	3
67	34	1	10	3	3	1	2	5	5	43	9	3	X	1	3	3	0	0	3	2	0	0	3	3	3	1	1	0	4	2	3	3	1	2	2	2	2	2	3
68	12	2	7	5	3	1	1	7	0	19	7	7	7	0	0	0	0	0	0	1	0	0	0	0	2	1	0	0	4	2	2	1	2	2	2	2	2	2	3
69	15	2	4	9	3	1	2	6	0	24	9	0	0	1	3	3	0	0	3	3	0	0	1	2	3	0	0	0	3	2	3	3	3	2	2	2	2	2	3
70	14	2	6	1	3	2	2	6	0	21	7	2	2	0	0	0	0	0	0	1	2	2	0	0	3	1	1	0	4	3	3	3	3	2	2	2	3	2	3
71	4	2	7	2	3	2	1	3	4	16	11	5	10	0	0	0	0	0	1	1	0	0	1	1	2	2	1	1	3	2	2	2	2	2	2	2	2	2	2
72	6	1	5	2	3	2	2	6	3	15	9	3	4	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	3	2	3	1	3	2	2	2	2	2	3
73	35	2	9	3	3	2	1	4	4	43	8	2	4	1	3	2	0	0	0	0	0	0	0	0	3	2	0	0	3	3	3	2	3	2	2	2	2	2	3
74	12	2	4	8	3	2	2	4	1	20	8	2	3	0	2	1	1	0	1	0	0	0	1	0	3	0	1	0	4	3	3	2	2	2	2	2	1	1	2
75	24	2	4	8	3	2	1	4	0	33	9	0	1	1	2	0	2	1	0	0	0	0	0	0	3	1	1	0	4	3	3	3	3	2	2	2	2	2	3

Legend to Table 1.

A Case
B Age
C Sex
 1 Female
 2 Male
D Leg Length Inequality (LLI) (cm)
E Diagnoses
 1 Congenital
 2 Congenital absent fibula
 3 Posttraumatic
 4 Epiphyseal injury
 5 Sequel of osteomyelitis
 6 Sequel of polio
 7 Sequel of tumor
 8 Morbus Blount
 9 Morbus Perthes
 10 Morbus Ollier
 11 Spastic hemiplegia
F Technique
 1 Callus distraction
 2 Direct lengthening
 3 Wagner lengthening
G Segment
 1 Femur
 2 Tibia
H Side
 1 Right
 2 Left
I Lengthened (cm)
J LLI estimated by surgeon (cm)
K Age at follow-up (years)
L Follow-up time (years)
M LLI estimated by the patient at follow-up (cm)
N LLI radiographic at follow-up (cm)
O LBP confirmed in medical report
 0 No
 1 Yes

Complaints
P Low back pain preoperative
Q Low back pain at follow-up
R Hip long side preoperative
S Hip long side at follow-up
T Hip short side preoperative
U Hip short side at follow-up
V Knee long side preoprative
W Knee long side at follow-up
X Knee short side preoperative
Y Knee short side at follow-up
Z Limping preoperative
AA Limping at follow-up
 0 No
 1 Slight
 2 Moderate
 3 Severe
AB Shoe-lift preoperative
AC Shoe-lift at follow-up
 0 No
 1 Yes
AD Occupation
 1 Retired
 2 Sick leave
 3 Student
 4 Full-time work
AE Work ability
AF Walking ability
AG Cosmetic appearance
AH Recreational activity
 1 Impaired
 2 Unchanged
 3 Improved

Joint motion on the lengthened side at follow-up
AI Hip joint clinical examination
AJ Knee joint evaluated by the patient
AK Knee joint clinical examination
AL Ankle joint evaluated by the patients
AM Ankle joint clinical examination
 1 Impaired
 2 Unchanged
 3 Improved
AN Patient's opinion of the result of lengthening
 1 Dissatisfaction
 2 Uncertain
 3 Satisfaction

Table 2. 10 patients and a total of 25 lengthenings were excluded. Patients were evaluated after the last lengthening

Technique	Cause
10 patients excluded	
2 Callus distraction	Short stature (4 femurs and 4 tibias)
1 Callus distraction	Psychosis. Lengthening aborted
2 Callus distraction	Lost to follow-up
1 Wagner lengthening	Lost to follow-up
1 Wagner lengthening	Refused to participate
1 Direct lengthening	Died
2 Direct lengthening	Lost to follow-up
9 lengthenings excluded	
4 Wagner lengthening	Subsequent callus distraction
3 Wagner lengthening	Repeated Wagner lengthening
2 Callus distraction	Repeated Wagner distraction

the lower extremities both preoperatively and at follow-up (Table 1).

The 18 patients aged 26 (15–36) years, who stated that they had had severe preoperative LBP, were all registered as suffering from LBP in the medical reports from the time of surgery. Severe or moderate LBP was reported by 36 patients before lengthening and, at follow-up, 27 of these had improved and no one had deteriorated. Of the 39 patients with little, if any, LBP prior to lengthening, 9 had deteriorated at follow-up (Table 1).

The degree of LLI did not correlate to LBP either preoperatively or at follow-up. More severe LBP was found with increased age in the total material, but in patients older than 15 years this was true only at follow-up. 5 of the 6 patients with severe LBP at follow-up had traumatic femoral shortenings.

12 patients, of whom 9 had traumatic shortening, complained of severe or moderate pain in the hip of the long leg before lengthening. 9 patients had improved. 20 patients, of whom 18 suffered from malunited femoral fractures, stated that they had severe-to-moderate pain from the hip on the short side before lengthening, and 15 of these had improved at follow-up.

54 patients complained of moderate-to-severe limping before lengthening and, at follow-up, 45 had improved. 54 regularly wore a shoe-lift preoperatively and at follow-up 17 still did but, of these, 6 compensated a LLI of 1.5 cm or less. There was no dif-

ference regarding the degree of preoperative LBP between the patients who used a shoe-lift and those who did not. Walking ability improved in 59 patients after lengthening while 7 found it impaired and 9 unchanged.

35 patients stated that the cosmetic appearance had improved while 21 (7 of 17 direct LL, 5 of 18 Wagner LL and 9 of 40 callus distractions) were dissatisfied with it and 19 found it unaffected by LL.

Working ability improved in 38, was not affected in 29 but deteriorated in 8 patients, of whom 6 had traumatic shortenings. 40 patients stated that their ability to participate in recreational activities had improved, 24 that it was unchanged, but 11 stated that it had deteriorated after LL.

51 patients found ROM in both knee and ankle joints not affected or improved by lengthening. Clinical examination revealed a decreased ROM compared to preoperative status in 17 patients. The loss of motion did not exceed 30°, except in 1 ankle joint.

60 patients were satisfied with the results of the lengthening. 5 patients, all with traumatic shortenings, were dissatisfied. 2 of these had been subjected to direct lengthening which, in 1 case, was complicated by a compartment syndrome, leaving the patient with a rigid and painful foot and decreased ROM in hip and knee. The other presented with a LLI of 5 cm. Of the 3 dissatisfied callus distraction cases, 1 patient reported more problems from a formerly ankylotic ankle joint and 2 were dissatisfied with the cosmetic result (Table 1).

10 patients were uncertain whether they had benefited from surgery or not. 7 found the cosmetic appearance less attractive and 5 found the lengthening procedure difficult; they had been subjected to more than 4 operations. 5 patients complained of restricted knee and/or ankle motion, 3 patients had a remaining LLI of 9 (6–10) cm and 2 had angular deviations exceeding 20°.

Discussion

Patients with LLI seek medical advice because of discomfort or pain from the locomotor system, the fear of future problems if the defect is left uncorrected or for cosmetic reasons. Children are brought by their parents who worry about future problems and the cosmetic appearance. Most publications concerning LL deal with technical aspects rather than with what is accomplished from the patient's point of view (Moseley 1989, Guidera et al. 1991).

LL has a great psychological impact on children but it can resolve without long-term sequelae (Hrutkay and Eilert 1990). Restricted joint motion was found during lengthening in most cases, but the patients generally regained preoperative ROM (Pouliquen et al. 1989). In a survey of 26 patients, who underwent lengthening because of congenital shortening, it was concluded that these patients had substantial problems with their feet, minor complaints from unstable knees and that the majority were dissatisfied with the cosmetic appearance after LL (Dutoit et al. 1990). Friberg (1983) demonstrated a correlation between LLI and LBP and between LLI and pain from the hip on the long side. These complaints diminished after a strict shoe-lift regime. Other authors (Hult 1954, Hellsing 1988) were unable to correlate LBP to LLI.

The aim of our study was to chart the complaints experienced by patients with major LLI and to obtain the patients' opinions about the effect of LL on the subjective symptoms which, to our knowledge, have never been studied before. In a retrospective study there is bias. People tend to forget episodes of LBP (Biering-Sörensen and Hilden 1984). Preoperative LBP reported by the patients were, however, in most cases confirmed by the medical reports from the time of surgery. Subjective evaluations by patients of the results of surgery were not as good or better, depending on the scoring system they were compared to (Andersson 1972). This material is heterogeneous in respect of diagnosis, age and surgical techniques, but we have studied the influence of these differences on the results. Even though the information presented may be considered as soft data, we decided to analyze it statistically to clarify any changes in preoperative symptoms.

More than half of the patients older than 15 years suffered from LBP prior to lengthening, which exceeds the prevalence of LBP in a general population (Bergenudd and Nilsson 1988). The preoperative use of a shoe-lift did not conclusively reduce LBP, in contrast to other studies (Friberg 1983). Our explanation for this difference is that, in our material, the shoe-lift was not worn permanently and usually did not fully correct the LLI.

A restricted joint motion, usually of a minor degree, was detected in more than one fifth of our patients, in contrast to other studies (Pouliquen et al. 1989). Every third patient complained of restricted joint motion at follow-up, which made us presume that a stiff joint was better tolerated if the leg was short.

The majority of patients were satisfied with the results obtained by lengthening. Complications to LL

(Paley 1990), major remaining LLI and an undesirable cosmetic appearance explained the overall dissatisfaction with LL. No patient with congenital shortening was dissatisfied with the results of the LL.

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