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**Supplementary material**

Commentary and Perspective, data tables, additional images, video clips and/or translated abstracts are available for this article. This information can be accessed at [http://www.ejbjs.org/cgi/content/full/91/4/797/DC1](http://www.ejbjs.org/cgi/content/full/91/4/797/DC1)

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**Publisher Information**

The Journal of Bone and Joint Surgery
20 Pickering Street, Needham, MA 02492-3157
[www.jbjs.org](http://www.jbjs.org)
Adult Outcomes Following Amputation or Lengthening for Fibular Deficiency

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Investigation performed at Shriners Hospitals for Children (Lexington, Kentucky; Northern California [Sacramento, California]; Erie, Pennsylvania; Chicago, Illinois; Springfield, Massachusetts; and Greenville, South Carolina)

Background: Fibular deficiency results in a small, unstable foot and ankle as well as a limb-length discrepancy. The purpose of this study was to assess outcomes in adults who, as children, had had amputation or limb-lengthening, commonly used treatments for fibular deficiency.

Methods: Retrospective review of existing data collected since 1950 at six pediatric orthopaedic centers identified 248 patients with fibular deficiency who were twenty-one years of age or older at the time of the review. Excluding patients with other anomalies and other treatments (with the excluded group including six who had had lengthening and then amputation), we identified ninety-eight patients who had had amputation or limb-lengthening for the treatment of isolated unilateral fibular deficiency. Sixty-two patients (with thirty-six amputations and twenty-six lengthening procedures) completed several questionnaires, including one asking general demographic questions, the Beck Depression Inventory-II, the Quality of Life Questionnaire, and the American Academy of Orthopaedic Surgeons Lower Limb Questionnaire including the Short Form-36. A group of twenty-eight control subjects completed the Beck Depression Inventory-II and the Quality of Life Questionnaire.

Results: There were forty men and twenty-two women. The average age at the time of the interview was thirty-three years. There were more amputations in those with fewer rays and less fibular preservation. Lengthening resulted in more surgical procedures (6.3 compared with 2.4 in patients treated with amputation) and more days in the hospital (184 compared with sixty-three) (both p < 0.0001). However, when we compared treatment outcomes we did not find differences between groups with regard to education, employment, income, public assistance or disability payments, pain or use of pain medicine, sports participation, activity restriction, comfort wearing shorts, dislike of limb appearance, or satisfaction with treatment. No patient who had been treated for fibular deficiency reported signs of depression. The only significant difference between treatment groups shown by the Quality of Life Questionnaire was in the scores on the Job Satisfiers content scale, with the amputees scoring better than the patients treated with lengthening (p = 0.015). The American Academy of Orthopaedic Surgeons Lower Limb Module did not demonstrate differences in health-related quality of life or physical function.

Conclusions: The patients who were treated with lengthening had started out with more residual foot rays and more fibular preservation than the amputees. They also required more surgical intervention than did those with an amputation. While patients with an amputation spent less of their childhood undergoing treatment, they were found to have a better outcome in terms of only one of seventeen quality-of-life parameters. Both groups of patients who had had treatment of fibular deficiency were functioning at high levels, with an average to above-average quality of life compared with that of the normal adult population.

Level of Evidence: Therapeutic Level III. See Instructions to Authors for a complete description of levels of evidence.

Disclosure: In support of their research for or preparation of this work, one or more of the authors received, in any one year, outside funding or grants in excess of $10,000 from Shriners Hospitals for Children and Kosair Charities, Inc. Neither they nor a member of their immediate families received payments or other benefits or a commitment or agreement to provide such benefits from a commercial entity. No commercial entity paid or directed, or agreed to pay or direct, any benefits to any research fund, foundation, division, center, clinical practice, or other charitable or nonprofit organization with which the authors, or a member of their immediate families, are affiliated or associated.
Fibular deficiency is the most common congenital deficiency of the long bones, with a reported prevalence of seven to twenty per million live births. It is theorized that a defect in the femoral-fibular-ulnar developmental field can result in a clinical spectrum ranging from complete absence of the limb or proximal femoral focal deficiency to a missing toe and simple tarsal coalition. The more common clinical problems attributed to isolated deficiency of the fibula include a small foot, poor ankle stability, and leg-length discrepancy. Syme or Boyd amputation or limb-lengthening during childhood are accepted treatments for these problems. Genu valgum, knee instability, and patellofemoral problems may also have to be corrected, but they rarely affect the choice of definitive treatment. Amputation allows the application of a prosthesis, which can be adjusted for length differences and enables the individual to experience a normal level of physical functioning. Limb-lengthening is a complex treatment involving multiple surgical procedures over a prolonged period of time, and the limb may have residual problems such as limited joint motion, muscle weakness, and bone fragility or deformity. However, lengthening and reconstruction allow the individual to retain the small foot and avoid the lifelong need for a prosthesis.

We are aware of few studies comparing the outcomes of these two common treatments for fibular deficiency. Naudie et al. found that patients treated with lengthening had more complications and needed more surgery than did those treated with amputation. Many of their patients treated with lengthening still required braces or shoe-lifts. Choi et al. reported an 88% rate of satisfactory results after amputation compared with a 55% rate after lengthening. McCarthy et al. found that, at a mean of seven years postoperatively, children who had had early amputation were more active, had less pain, and were more satisfied than were those who had had lengthening.

Information on the long-term outcomes of these two treatments is scarce. Birch et al. reported on ten adults who had had amputation when they were children. The patients found that amputation did not limit their ability to pursue or achieve personal goals. Dutoit et al. reviewed the cases of twenty-six adults who had had lengthening and found radiographic deterioration of the knee and ankle. Twenty-two of these patients considered their limb to be unaesthetic and twenty continued to have problems with their shoes.

Since the ultimate goal of treatment for children with fibular deficiency is a high-level quality of life throughout their lifetime, the purpose of this study was to compare these two treatment regimens with regard to their outcomes in adulthood. This was accomplished with use of validated outcomes instruments to assess depression, quality of life, general health, and physical functioning in a follow-up study of adults in whom fibular deficiency had been previously treated with amputation or lengthening.

**Materials and Methods**

This retrospective comparative study was approved by the medical institutional review board at each of the six pediatric orthopaedic centers. Patients with fibular deficiency were identified through the hospital diagnosis-based databases and from a list of all patients who had been seen at each hospital from 1950 to the present. Existing records and radiographs of all patients, twenty-one years of age or older, who had been treated for fibular deficiency at six centers were reviewed for information regarding the fibular deficiency, resultant deformities, and treatments. If a physical finding was recorded in the chart as being present it was considered to be present. If a physical finding was not mentioned, it was considered to be absent unless existing photographs or radiographs showed the abnormality.

To confirm the diagnosis, all charts and radiographs retrieved from the database search were reviewed by two investigators (J.L.W. and J.L.B.). The diagnosis was confirmed in 248 patients, on the basis of documentation to the effect that fibular deficiency was present. Sixty patients with bilateral fibular deficiency, twelve with contralateral lower-limb anomalies, thirty-seven with ipsilateral proximal femoral focal deficiency or a congenitally short femur (fibular deficiency that was greater than tibial discrepancy), and one with Charcot-Marie-Tooth disease were excluded from the study. Since mild femoral hypoplasia, genu valgum, patellofemoral problems, tibial bowing, foot deformities, and tarsal coalition are so common in patients with fibular deficiency, these diagnoses were not used as exclusion criteria. Because questionnaires were valid only when used by English-speaking persons, non-English-speaking patients (n = 7) were excluded. One patient was known to have died and was also excluded. Only those patients who had had lengthening or a Syme or Boyd amputation (a through-the-ankle joint amputation that preserved the heel pad), but not those who had had both, were included in the comparison of treatments. Six patients who had had initial attempts at lengthening and, for reasons not completely clear in the record, later had amputation and twenty-six who had had other types of surgery or no surgery at all were also excluded. During the time frame in which these children had surgical treatment, there were no uniform protocols in place at any of the six centers. Decisions about treatment were made by the parents and surgeons. Because of the retrospective nature of this study, the criteria for treatment decisions could not be discerned.

After the above exclusions, the study population included sixty-one patients treated with amputation and thirty-seven treated with lengthening. Using last known addresses, telephone numbers, parents’ names, Social Security numbers, and Internet searches, we located sixty-two former patients (thirty-six treated with amputation and twenty-six, with lengthening), and all agreed to complete the questionnaires listed below, in person or by telephone, administered by one of the investigators (D.K.). Because of the time required to answer all of these questions, not all patients chose to complete all questionnaires.

**General questionnaire:** This nonvalidated form was designed locally to collect basic demographic and socioeconomic data (based on the U.S. Census format), to perform the evaluations of knee symptoms and comfort with physical appearance, and to evaluate patient satisfaction (with the questions used in the study by McCarthy et al.).

**Beck Depression Inventory-II:** This twenty-one-question validated screening tool is used to detect possible symptoms of
depression that may have an impact on responses to other questions regarding quality of life and physical functioning.

Quality of Life Questionnaire**: The Quality of Life Questionnaire is used to examine five major quality-of-life domains with use of fifteen content scales, a social desirability scale, and a total quality-of-life score. It is a validated outcome tool with established norms.

American Academy of Orthopaedic Surgeons Lower Limb Module**: This is a validated outcomes questionnaire consisting of the Short Form-36, a general health-based survey of quality of life, and questions regarding lower-limb function. General population norms are reported.

American Academy of Orthopaedic Surgeons Foot and Ankle Module**: This is a validated outcome tool similar to the American Academy of Orthopaedic Surgeons Lower Limb Questionnaire that contains a Short Form-36 and questions regarding foot and ankle function and shoe comfort. All patients completed the Short Form-36 as part of the American Academy of Orthopaedic Surgeons Lower Limb Module. The foot and ankle function questions from this Foot and Ankle Module were completed only by the patients treated with lengthening. Both groups completed the shoe-comfort questions.

Prosthesis Evaluation Questionnaire**: This is a validated visual analogue questionnaire used to measure patients’ satisfaction with their prosthesis. When this questionnaire was used in a telephone interview, we asked subjects to answer the questions on a scale of 0 to 10, with 0 indicating very dissatisfied and 10 indicating very satisfied. The total scores were calculated in the same fashion as those for the questionnaire on which the patient marked their response. While this methodology has not been validated, it gives some measure of the amputee’s prosthesis-related quality of life. This questionnaire was administered only to the patients who had an amputation.

As recommended by a consulting biostatistician, the Quality of Life Questionnaire and the Beck Depression Inventory-II were also administered to a control group to account for any temporal societal stresses that might have occurred during the time frame of our interviews but that could not be measured or controlled for. Examples are feelings about the economy, the war in Iraq, or the terrorist attacks on September 11, 2001. By introducing a control group to complete these questionnaires, we increased, if not eliminated, the likelihood that the psychosocial results were related to our patients’ physical impairment rather than to any salient global stressors. The normative data provided with the Quality of Life Questionnaire have a standard deviation of 10. Because of uncertainty about the variability in a smaller control group, we estimated a standard deviation of between 10 and 25. It was estimated that, in order to have an 80% chance of detecting a difference in the means of 20 between the control group and either the amputation or limb-lengthening group, a sample size of between five and twenty-six control subjects was required. Control subjects were recruited by posting flyers at local grocery and department stores, libraries, hospitals, and university student centers in the community of the main investigators. Twenty-eight adults who were twenty-one years or older, were in good health, had normal cognition, and had no known orthopaedic problems consented to complete these two questionnaires. The characteristics of these volunteers were not otherwise matched to those of the patients who had been treated for fibular deficiency. T tests, chi-square tests, analysis of variance with Bonferroni post hoc analyses, and correlation coefficients were performed with SAS** and StatView** software to carry out comparisons among the different treatment groups and the control group. Power analyses and sample-size calculations were performed with use of web-based software**.

Source of Funding
The external funding sources for this study played no role in the study design, implementation, data interpretation, or preparation of this report. They provided funds for staff salary support and supplies.

Results
Forty men and twenty-two women who had been treated for fibular deficiency were interviewed. Their average age was thirty-three years, with a range of twenty-one to fifty-five years. No differences in terms of age or sex distribution, side involved, number of residual rays, extent of fibular deficiency, tibial bowing, or the procedures performed were found between the sixty-two patients who were interviewed and the thirty-six patients who were not located (p = 0.23 to 0.99).

A comparison of the characteristics of the interviewed patients who had an amputation with those of the patients who were treated with lengthening as well as of the deformities of the two groups is presented in Table I. The extent of fibular absence was classified with the system described by Achterman and Kalamchi**. Type I indicates that some of the fibula is present and is subdivided into Type IA and Type IB. In Type IA, the distal fibular physis is proximal to the dome of the talus and the proximal fibular epiphysis is distal to the proximal tibial physis. In Type IB, 30% to 50% of the fibula remains and, although it is present distally, it does not support the ankle laterally. Type II indicates that there is no fibula or only a vestigial remnant of the fibula, and it is the most common form. The number of residual metatarsals, the presence of tibial bowing, and the extent of the fibular deficiency differed significantly between the treatment groups, with greater degrees of deficiency and deformity seen in the amputation group (Table I). Lengthening resulted in significantly more surgical procedures and a higher total number of days in the hospital. The number of surgical procedures and the total number of days in the hospital refer to all operations and hospital days due to the treatment of the fibular deficiency and related lower-extremity and prosthetic problems and include the days spent in inpatient rehabilitation for that treatment. The total number of days in the hospital did not correlate with the scores on the Beck Depression Inventory-II, Quality of Life Questionnaire, Short Form-36, or American Academy of Orthopaedic Surgeons Lower Limb Module ($R^2$ range = 0.0004 to 0.161).

The twenty-six patients treated with lengthening had, in total, forty-eight limb segments (forty-one tibiae and seven
femora) lengthened. Two patients had simultaneous lengthening of the tibia and femur, and the remainder of the operations were done as separate procedures. One limb segment was lengthened in eight patients; two, in fourteen patients; and three, in four patients. Fourteen lengthening procedures were reportedly done with the Wagner technique; fourteen, with the Ilizarov technique; ten, with the Anderson technique; five, with an EBI Orthofix device; one, with the Abbott technique; two, with traction over a Rush rod; and two, with an unknown method. The average amount of length gained by the forty lengthening procedures for which the amount was recorded was 4.9 cm, with a range of 2 to 10.8 cm. The number of limb segments that had been lengthened did not correlate with the scores on the Beck Depression Inventory-II, Quality of Life Questionnaire, Short Form-36, or American Academy of Orthopaedic Surgeons Lower Limb Questionnaire (R² range = 0.00002 to 0.326). In addition to the lengthening procedures, a contralateral epiphysiodesis to adjust limb length was used in the proximal part of the tibia of two patients, the distal part of the femur of one, and both the proximal part of the tibia and the distal part of the femur of six. One patient also had a contralateral femoral shortening. The average age of the thirty-six patients who had a Syme or Boyd amputation was 4.1 years (range, six months to 17.3 years) at the time of the amputation. The age at amputation did not correlate with the scores on the Beck Depression Inventory-II, Quality of Life Questionnaire, Short Form-36, or American Academy of Orthopaedic Surgeons Lower Limb Questionnaire (R² range = 0.00006 to 0.173). The group as a whole had an average of 1.2 procedures before or after the amputation. Twelve of the thirty-six patients had an average of two surgical procedures prior to the amputation, most often in an attempt to correct the foot/ankle deformity. Eighteen had an average of 3.3 surgical procedures after the amputation. This included six patients who had a total of twelve operations for stump-related problems, five patients who had a total of eight operations for treatment of femoral valgus, and four patients who had patellar realignment procedures. Eight patients also required osteotomy of the tibia to treat anterior bowing and/or valgus deformities. The tibial osteotomy was performed prior to the amputation in one patient, concomitant with the amputation in two, and following it in five.

General questionnaire (see Appendix): There were no significant differences between treatment groups with regard to educational achievement, employment, income level, public assistance, or disability payments. We also did not find significant differences in reported limb pain, use of pain medicine, sports participation, reported activity restriction, dislike of limb appearance, or satisfaction with treatment. Finally, we did

<table>
<thead>
<tr>
<th>TABLE I Comparisons of the Amputation and Limb-Lengthening Groups</th>
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<tbody>
<tr>
<td>Classification²² ([IA + IBJ]/II)</td>
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<tr>
<td>Presence/absence of ankle equinus</td>
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<tr>
<td>Presence/absence of ankle valgus</td>
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<tr>
<td>Presence/absence of tibial bowing</td>
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<tr>
<td>Mean no. of foot rays</td>
</tr>
<tr>
<td>Presence/absence of tarsal coalition</td>
</tr>
<tr>
<td>Mean no. of procedures</td>
</tr>
<tr>
<td>Mean no. of days in hospital</td>
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</table>

*The values are given as the number of patients unless otherwise indicated.
not find differences in comfort wearing shorts as rated on a scale of 0 for “so uncomfortable as to not wear shorts in public” to 10 for being “fully comfortable wearing shorts in public without concern about appearance.”

Beck Depression Inventory-II (see Appendix): We found no significant difference in the scores on the Beck Depression Inventory-II between the amputees and the patients treated with lengthening. The controls had a significantly higher total score than the amputees, suggesting that the control participants had more depression. However, the mean scores for both groups were within the scale of “no indicators of depression.” According to the Beck Depression Inventory-II, no subject who had had treatment of fibular deficiency demonstrated indicators of depression. One control subject scored in the range of moderate depression.

Quality of Life Questionnaire (see Appendix): The only significant difference between the treatment groups was on the Job Satisfiers content scale, with the amputees scoring better than the patients treated with lengthening. The Quality of Life Questionnaire Manual indicates that those who achieve high scores on this scale report that they have good salary, benefits, chances for promotion, opportunities for involvement in job activities, reinforcement, and opportunities for training. Those who achieve low scores report that their pay and benefits are poor, that they have little chance for involvement in job activities, that promotion is unlikely, and that they would change jobs if they could. For a number of the Quality of Life Questionnaire parameters, the fibular deficiency group scored higher than the controls. In all groups, the mean scores for all parameters were within one standard deviation of the reported general population means of 50.

Short Form-36 (see Appendix): A comparison of the normative scores for the different scales of the Short Form-36 did not indicate any differences in health-related quality of life between the amputation and limb-lengthening treatment groups. Both groups had mean scores that were within one standard deviation of the reported general population means of 50.

American Academy of Orthopaedic Surgeons Lower Limb Module (see Appendix): There were no significant differences between the amputation and limb-lengthening groups with regard to lower-limb physical functioning or their reported shoe-comfort scores. The mean score for both groups was within one standard deviation of the reported general population means of 50.

American Academy of Orthopaedic Surgeons Foot and Ankle Module: As assessed with the American Academy of Orthopaedic Surgeons Foot and Ankle Module, the foot and ankle physical functioning of eleven patients treated with lengthening had a mean normative score of 45.4, with a range of 29.5 to 55.6. This mean score was within one standard deviation of the reported general population mean of 50. Two patients scored more than one standard deviation below the mean.

Prosthesis Evaluation Questionnaire: All of the amputees who were surveyed had a prosthesis, and a Prosthesis Evaluation Questionnaire was completed for thirty-one of them. The mean score was 76.9 (range, 49 to 92) on a scale of 0 for very dissatisfied to 100 for very satisfied. Younger patients were more satisfied with the prosthesis (p = 0.043), and this satisfaction was correlated with a higher level of comfort with wearing shorts in public (p = 0.0065).

Discussion

The purpose of this study was to compare long-term functional outcomes after amputation and lengthening for the treatment of unilateral fibular deficiency. A large population of patients with a diagnosis of fibular deficiency was initially identified, but many were excluded in order to achieve subject groups with appropriate indications for either treatment. Of those who met our very strict criteria and had had a Syme or Boyd amputation or a limb-lengthening, 63% were interviewed. Analysis of preoperative variables demonstrated that the patients who were interviewed were, overall, eight years younger than, but were otherwise representative of, the entire group treated with amputation or lengthening. However, the patients who were not found may have had other differences at the time of follow-up that made them more difficult to locate.

Because of the retrospective nature of this study and the clinical variability of fibular deficiency, it was not feasible to have matched groups. Both procedures were performed at all centers, but treatment decisions were made by parents and surgeons without any established protocols. While some amputees had one or two residual metatarsals at birth, all patients who were treated with lengthening had three or more. There appeared to be a treatment bias for amputation in persons with fewer residual rays. This would seem to be appropriate by today’s standards, as lengthening of a limb with one or two residual rays would, at best, result in a limb of adequate length with a foot so small it would be ineffective for push-off and cause problems with shoe wear.

Existing radiographs allowed classification only on the basis of the amount of fibular absence. There was a treatment bias toward amputation for patients with a larger degree of fibular absence or the presence of tibial bowing. This might be expected since greater deficiency of the distal portion of the fibula results in difficulty with stabilizing and maintaining functional ankle alignment. Tibial bowing is also associated with a greater degree of fibular deficiency. As a result of the retrospective nature of this study, there was insufficient documentation of the amount of foot and ankle deformity and overall limb-length discrepancy prior to treatment to allow classification on the basis of the more recent criteria used to grade fibular deficiency and for surgical planning. However, the prevalence of ankle deformity and tarsal coalition appeared to be the same in the two groups. Retrospective chart and radiographic review may have led to underreporting of the frequency of these abnormalities since tarsal coalitions may not be seen on radiographs of young children or be reported in operative reports on amputation specimens.

As expected, patients treated with lengthening had more frequent surgical intervention than did those with amputation. Because of the time frame in which these adults were treated as children, this review includes patients who were managed with...
techniques that are no longer used. Also, because many advances in medical care and hospitalization practices have occurred, the patients in both groups would have spent fewer days in the hospital and perhaps had fewer surgical procedures had they been treated today. Because of these advances, the technical outcomes of limb-lengthening procedures done today might be better than those experienced by the former patients in this study. The same can be said of the results of the amputations because of advances in prosthetic design, suspension, and rehabilitation. Other authors have speculated that, despite the higher initial costs of limb-lengthening due to greater medical and surgical intervention, lengthening is less expensive than amputation if the lifetime costs of the prostheses are included.\textsuperscript{17,20}

Unlike McCarthy et al.\textsuperscript{30}, who performed a short-term follow-up study, we did not find differences in the reported pain level or satisfaction with treatment between patients treated with lengthening and those treated with amputation. Because our patients were not examined at the time of follow-up, residual problems such as foot and ankle deformity, limb-length inequality, limb malalignment, and knee dysfunction could not be assessed. The responses to the American Academy of Orthopaedic Surgeons Lower Limb Module did not reflect differences in levels of physical functioning, although it should be noted that, because of the time required for the interviews, this questionnaire was completed by fewer patients than the other questionnaires. This presents a possible selection bias based on subject fatigue.

The Quality of Life Questionnaire showed that all patients who had been treated for fibular deficiency were experiencing a quality of life in a range of slightly below to slightly above reported norms. Statistically, the only difference between the treatment groups was in the scores on the Job Satisfiers scale, with the amputation group scoring better than the limb-lengthening group. We found no significant difference between the amputation and control groups with regard to their scores on the Job Satisfiers scale or the Occupational Relations scale on the Quality of Life Questionnaire. However, the Job Characteristics subscore for the controls was significantly poorer than that for the amputees. Despite these statistical differences, the mean scores on the Quality of Life Questionnaire for both of our treatment groups and for our controls were within one standard deviation of reported general population means. Gerhards et al.\textsuperscript{32} demonstrated that adults with an acquired above-the-knee amputation reported greater job satisfaction than controls despite the amputees having a lower occupational status than the controls. Schoppen et al.\textsuperscript{33} showed that adults with an acquired lower-limb amputation had greater job satisfaction than able-bodied controls despite having worse physical health scores on the Short Form-36 than the control group.

We also did not find differences between our amputation and limb-lengthening groups with regard to the scores on the Short Form-36. In both of our patient groups who had been treated for fibular deficiency, the score for general health outcome on the Short Form-36 was within one standard deviation of general population norms. Demet et al.\textsuperscript{34} reported on health-related quality of life of amputees. Using the Nottingham-Ham Health Profile, they assessed adult patients who had had major limb amputations. They found that a young age at the time of the amputation was associated with a better health-related quality of life in the categories of physical disability, energy level, emotional reactions, and social isolation. The fact that our patients who had the amputation in childhood may explain the high level of health and function that they were experiencing compared with general population norms. However, we could not correlate outcomes to patient age at the time of the amputation in this study.

In our control group of adults without general health or orthopaedic problems, the scores on the Beck Depression Inventory-II and for a number of the Quality of Life Questionnaire parameters were significantly below those for the patients who had been treated for fibular deficiency. While significant, the mean differences between the groups were small. There is often a general assumption that people who have undergone major medical treatment for physical disabilities have a diminished quality of life. However, several studies have demonstrated that this is not the case. Livingston et al.\textsuperscript{35} reported that there is no consistent correlation between physical function and psychosocial well-being. Studies have shown that the quality of life of cancer survivors\textsuperscript{36} and patients with spinal cord injury\textsuperscript{37} was equal to or better than those found in the general population. Gerhards et al. suggested that psychological adaptation is a likely reason for these results.\textsuperscript{38} Another reason for the quality-of-life results found in our study may be that traumatic events have a greater impact on quality of life than do congenital anomalies. A study investigating injury in adolescence showed that major trauma in this age group is associated with significantly lower quality-of-life outcomes compared with those in a healthy control group (p < 0.0001). In a series of studies of the prospective Copenhagen Birth Cohort in Denmark, Ventegodt et al.\textsuperscript{39} concluded “that our quality of life, health and ability as adults are primarily determined by what we ourselves choose to do with our lives as young people and as adults—and only to a marginal degree determined by factors related to our background.” These reports corroborate the findings in the present study that the quality of life of adults who had been treated for fibular deficiency is not diminished, and is somewhat better, compared with that of nondisabled peers.

In summary, we demonstrated that adults who had been treated for fibular deficiency in childhood function well, with an average to above-average quality of life regardless of whether the treatment consisted of amputation or limb-lengthening. This study did not show a clear preference for one treatment or the other. Amputation had a better outcome only in terms of the score on the Job Satisfiers content scale, while all other measures of depression, quality of life, general health, and physical functioning were not significantly different between the two groups. More sophisticated and disease-specific outcome tools may be able to identify differences. This study was not designed to detect a clear superiority of one treatment over the other since the two cohorts of patients differed with regard to the extent of the deformity and the decision-making regarding the chosen surgical treatment. At this point, recommendations to patients
still have to be individualized and involve long discussions of the pros and cons of the available treatments.

Appendix

tables showing details of the outcomes comparisons among the groups are available with the electronic versions of this article, on our website at jbjs.org (go to the article citation and click on "Supplementary Material") and on our quarterly CD/DVD (call our subscription department, at 781-449-9780, to order the CD or DVD). ■

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