

# NERVE LESIONS ASSOCIATED WITH LIMB-LENGTHENING

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**Background:** Nerve injury is one of the most serious complications associated with limb-lengthening. We examined the risk, assessment, and treatment of nerve lesions associated with limb-lengthening.

**Methods:** We retrospectively studied the records on 814 limb-lengthening procedures. Nerve lesions were defined by clinical signs and symptoms of motor function impairment, sensory alterations, referred pain in the distribution of an affected nerve, and/or positive results of quantitative sensory testing with use of a pressure specified sensory device.

**Results:** Seventy-six (9.3%) of the limbs had a nerve lesion. Eighty-four percent of the nerve lesions occurred during gradual distraction, and 16% occurred immediately following surgery. The pressure specified sensory device showed 100% sensitivity and 86% specificity in the detection of nerve injuries. The patients in whom the lesion was diagnosed with this method, or with this method as well as with nerve conduction studies, had significantly faster recovery than did those diagnosed on the basis of clinical symptoms or nerve conduction studies alone ( $p = 0.02$ ). Patients undergoing double-level tibial lengthening and those with skeletal dysplasia were at higher risk for nerve lesions (77% and 48%, respectively). Nerve decompression was performed in fifty-three cases (70%). The time between the diagnosis and the surgical decompression was strongly associated with the time to recovery ( $p = 0.0005$ ). Complete clinical recovery was achieved in seventy-four of the seventy-six cases.

**Conclusions:** Early detection based on signs and symptoms or testing with a pressure specified sensory device improves the prognosis for nerve injury that occurs during limb-lengthening. Of the methods that we used to identify neurologic compromise, testing with the pressure specified sensory device was the most sensitive. Aggressive early treatment (slowing the rate of lengthening and/or performing decompression) allows continued lengthening without incurring permanent nerve injury. When indicated, decompression of the affected nerve should be performed as soon as possible, thereby improving the chances of and shortening the time to complete recovery.

**Level of Evidence:** Prognostic study, Level II-1 (retrospective study). See Instructions to Authors for a complete description of levels of evidence.

Nerve injury is one of the most serious complications associated with limb-lengthening. Acute methods of limb-lengthening are often complicated by nerve palsy and chronic neurogenic pain<sup>1,2</sup>. Nerve injury is less common with gradual lengthening, but it has been reported in many series<sup>3,7</sup>. Nerve injury has been reported to occur immediately postoperatively or during the distraction process<sup>3,8</sup>. When the nerve injury occurs immediately postoperatively, the cause is usually apparent: it can be the result of direct surgical trauma from a wire, a drill bit, or instruments used to perform the osteotomy or it can be due to indirect stretch injury from acute correction of deformity. In contrast, the causes of nerve injuries occurring during the gradual distraction process are less obvious.

In an experimental study of limb-lengthening performed on dogs, Strong et al.<sup>9</sup> concluded that nerve injury occurs at the level of the nerve roots. Paley<sup>6</sup> reported peroneal

nerve entrapment at the level of the neck of the fibula. Young et al.<sup>10</sup> observed electromyographic changes that returned to normal after a period of time. Despite these findings, there has been no consensus regarding the etiology of nerve injury during lengthening.

Nerve injury has been considered to be a contraindication to further lengthening because of the risk of permanent injury<sup>11</sup>. However, Paley<sup>6</sup> reported that peroneal nerve decompression can lead to full recovery even if the lengthening process is continued. The purpose of the present study was to determine the prevalence, presentation, predisposing and causative factors, diagnostic and treatment modalities, and prognosis of nerve lesions associated with limb-lengthening.

## Materials and Methods

Between January 1989 and December 1999, 814 limbs were lengthened in 650 patients by the two senior authors (D.P.