

# Orthopaedic care in spina bifida: past, present, and future

The incidence of spina bifida has dropped significantly in many countries over the last several years. This change has occurred secondary to the use of folic acid, and prenatal diagnosis with termination of pregnancy. The overall care of children with spina bifida has also changed substantially in the past 30 years. These changes have occurred in all specialties: neurosurgery, urology, orthopaedics, rehabilitation, and orthotics.

My involvement in the orthopaedic care of children with spina bifida goes back almost 30 years. Today's approach to many of the orthopaedic problems is quite different from the protocol of the 70s and 80s. These changes occurred because of a better understanding of the orthopaedic deformities which affect function, aided by the advent of gait analysis in the late 80s.

Let's look at some of these pathologies in which there has been significant improvement in the management of spina bifida:

(1) *Scoliosis*. With the new types of instrumentation, together with changes in postoperative management, there has been considerable improvement in final outcome. Knowing that pelvic motion is important in the ambulatory patient (low lumbar and sacral levels) has led spine surgeons to avoid lumbosacral fusions.

(2) *Kyphosis*. Kyphectomy is one of the most challenging procedures for the spine surgeon. Complication and mortality rates in the past were quite high. New techniques, such as the decancellation, longer fusion, and early intervention (at around 3 years), have shown remarkable improvements in the final outcome.

(3) *Hip dislocation*. In the 60s and 70s, an aggressive approach to hip dislocation was advised.<sup>1</sup> The iliopsoas transfer was the procedure of choice. The anatomic location of the hip was considered to be very important. Other approaches were also recommended, such as the external oblique transfer in association with a varus osteotomy. In 1978 Feiwell wrote, 'A level pelvis and a good range of hip motion are more important for function than reduction of the hips. The goal of treatment should be maximum function, not radiographic reduction of the dislocated hips'.<sup>2,3</sup> The use of gait analysis<sup>4</sup> demonstrated how correct Feiwell was with his statement. Currently, the approach to hip dislocation in the child with low lumbar level is much simpler. If a contracture is present, leading to an asymmetrical gait, treatment is directed at the contracture with no attempt to reduce the hip. Hip dislocation in the child with a sacral level lesion (walking with no support) should be seen as a lever arm dysfunction and surgical relocation of the hip is indicated.

(4) *Knee valgus stress*. In the child with low lumbar and sacral levels it is well known that abnormal knee valgus stress can lead to knee pain and arthritis in adult life.<sup>5</sup> The use of gait analysis has enabled the identification of multiple factors that can lead to this abnormal valgus stress. Rotational malalignment of the femur, femoral anteversion in association with excessive external tibial torsion, are the most common deformities leading to this problem. Excessive trunk and pelvic movement as well as knee flexion contractures are also important factors. Surgical correction

of these excessive rotational deformities can decrease valgus stress.<sup>6,7</sup> Aggressive treatment of these problems is indicated in patients over the age of 6 years.

(5) *Foot deformities*. Due to the lack of normal sensation it is well known that a rigid foot in spina bifida is prone to pressure sores. It is also well known that about 95% of patients with spina bifida will require the use of an orthosis. So, a supple, flexible, flail foot should be our final goal of treatment for foot deformities. Arthrodesis, such as subtalar joint or triple arthrodesis, should be avoided. When required, bone procedures should be extra-articular, thereby preserving motion. With rare exceptions, in the child with very low level lesion who walks with no braces, tendon transfers are not effective in spina bifida. A flail foot approach permits easier bracing. Simple tenotomies should replace tendon lengthenings and transfers.

In summary, the most important change in the past 30 years has been the focus on function and not on radiological changes. Surgeries are directed toward functional improvement. The use of gait analysis as a preoperative diagnostic tool has provided a major step in establishing these changes in our orthopaedic treatment.

In the future, besides a wider use of gait analysis, we clearly need to find ways to increase muscle strength in spina bifida. Research should look at the use of stem cells to build up new muscle cells in the partially denervated muscles, such as the gluteus and gastrocnemius. With stronger muscles that generate power, walking ability is likely to improve. Trunk and pelvic movement, as well as the need for orthoses, will decrease as will energy consumption as the gait normalizes. Further work should be directed toward improving children's fitness, muscle strength, and endurance.

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