Complications of pelvic obliquity in neuromuscular scoliosis can be quite serious, including low back pain, discomfort with sitting, and pressure ulcers.

Correction of pelvic obliquity with scoliosis surgery is often necessary to avoid life threatening comorbidities and diminished quality of life. Due to the significance of pelvic obliquity in surgical decision making, appropriate evaluation of this pathology is important.

Evaluation of pelvic obliquity involves the measurement of the degree of displacement of the pelvic girdle, which can occur either in the frontal, sagittal or transverse planes. Variability of displacement and presentation has led to various methods of measurement, with focus primarily on frontal deviation, without a consensus or gold standard measurement.

This study evaluated the reliability of 5 methods commonly used to determine pelvic obliquity in the frontal plane. A group of pediatric orthopaedic surgeons and residents rated a series of radiographs using each method: intra and inter-observer reliability was measured.

Radiographic images of 55 patients with neuromuscular scoliosis involving the pelvic girdle were identified and evaluated by a team of 5 raters. The team was made up of 4 Pediatric Orthopedic Surgeons and 1 Orthopedic Surgery resident representing a variety of experience in evaluating pelvic obliquity.

Each rater was instructed to apply 5 commonly used methods of measuring pelvic obliquity to all images. The methods are Maloney, O’Brien, Osebold, Allen and Ferguson, and Lindseth (Figure 1). The same raters were asked to rate the same radiographs again after a minimum of one month.

The data was transformed to be closer to normal. The inter-observer analysis was completed using the intra-class correlation coefficient and the intra-observer analysis was performed using the Pearson correlation.

The correlations were interpreted using established conventions for kappa, where 0 to 0.2 is slight agreement, 0.2 to 0.4 is fair agreement, 0.4 to 0.6 is moderate agreement, 0.6 to 0.8 is substantial agreement and >0.8 is excellent agreement.

The results for inter-observer reliability are shown in figure 2. The Maloney method produced an ICC of 0.965 and 0.964 in session 1 and 2, respectively. In the O’Brien method, the ICC was 0.938 and 0.926. In the Osebold method, the ICC was 0.947 and 0.959. In the Allen and Ferguson method, the ICC was 0.88 and 0.92. In the Lindseth method, the ICC was 0.898 and 0.882.

The intra-observer reliability as measured by the Pearson correlation is shown in figure 3. In the Maloney method it was 0.883. In the O’Brien method it was 0.734. For Osebold, it was 0.815. For the Allen and Ferguson method it was 0.679. For the Lindseth method it was 0.683.

Discussion

Obliquity measured by the method established by Maloney et al. had the best inter and intra-observer correlation.

The Maloney method should be used when evaluating pelvic obliquity on an AP radiograph. Other methods evaluated in this study were not as reliable.