We describe a modified fulcrum design to overcome limitations of a traditional fulcrum. The modified fulcrum is a triangular prism–shaped foam with rounded and padded edges. The 3 faces of the fulcrum represent 3 different heights (17.0 cm, 17.5 cm, and 21.0 cm). For fulcrum bending radiographs of the thoracic curve, the patient is placed on an X-ray table in a lateral decubitus position over the fulcrum. The apex of the appropriate height of the fulcrum is positioned under the rib corresponding to the apex of the curve, such that the ipsilateral shoulder is lifted off the X-ray table for maximum passive bending force to the curve. For fulcrum bending radiographs of the lumbar curve, the fulcrum is positioned directly under the apex of the curve such that the ipsilateral iliac crest is lifted off the X-ray table.

Key words: radiography; scoliosis; spine

INTRODUCTION

In patients with adolescent idiopathic scoliosis (AIS), the flexibility of spinal curvatures is assessed to identify the characteristics of the curve and facilitate clinical decision-making in terms of levels to be fused, the extent of expected surgical correction, and whether additional surgical intervention is necessary.1,2 Methods to assess spinal flexibility include the use of active lateral bending,3–6 prone-push,7,8 supine traction,9,10 and fulcrum bending radiographs.1,11–27

Fulcrum bending radiography was first used to assess spinal flexibility in AIS patients with hook systems.1 A fulcrum is a padded, radiolucent cylinder placed under the rib corresponding to the apex of the curve while the patient is placed in the lateral decubitus position.1 This method uses passive rather than active forces and reduces personnel exposure of ionising radiation, compared with supine traction radiography.1 Fulcrum bending radiography is more predictive of the degree of curve flexibility and the amount of curve correction, compared with supine bending radiography.1 Fulcrum bending radiography...
facilitates selection of fusion levels in patients with thoracic AIS. Its predictive value in the setting of pedicle screw constructs has been validated. The fulcrum bending correction index is a preferred tool to describe the degree of scoliosis correction by taking into account the curve flexibility. The index has been used to compare scoliosis correction after different instrumentations. Although fulcrum bending radiography is increasingly popular, the technique has some limitations. The fulcrum may roll during patient positioning; the hard material is uncomfortable for thin patients or those with large curves; and multiple sizes are needed. Thus, a modified fulcrum is developed and its use is described below.

TECHNICAL NOTE

The modified fulcrum is a triangular prism-shaped foam with rounded and padded edges (Fig. 1). The 3 faces of the fulcrum represent 3 different heights (17.0 cm, 17.5 cm, and 21.0 cm). For the thoracic curve with an apex at T7 or below, standing anteroposterior radiographs of the whole spine are first taken to locate the rib corresponding to the apex of the curve. For fulcrum bending radiographs of the thoracic curve, the patient is placed on an X-ray table in a lateral decubitus position over the fulcrum. The apex of the appropriate height of the fulcrum is positioned under the rib corresponding to the apex of the curve, such that the ipsilateral shoulder is lifted off the X-ray table for maximum passive bending force to the curve (Fig. 2). The hips and knees are flexed slightly to avoid rolling. If necessary, additional sandbags are used. The pelvis and shoulder are perpendicular to the X-ray beam. After radiography, the correct positioning of the fulcrum under the apex of the curve is verified by comparing the standing anteroposterior radiographs and fulcrum bending radiographs (Fig. 3). For fulcrum bending radiographs of the lumbar curve, the fulcrum is positioned directly under the lateral decubitus position over the fulcrum. The apex of the appropriate height of the fulcrum is positioned under the rib corresponding to the apex of the curve such that the ipsilateral shoulder is lifted off (arrow) the X-ray table for maximum passive bending force to the curve. The hips and knees should be flexed slightly to avoid rolling. The pelvis and shoulder should be perpendicular to the X-ray beam. (b) For fulcrum bending radiographs of the lumbar curve, the fulcrum is positioned directly under the apex of the curve such that the ipsilateral iliac crest is lifted off (arrow) the X-ray table.
apex of the curve, such that the ipsilateral iliac crest is lifted off the X-ray table.

CONCLUSION

The modified fulcrum is convenient, simple, and comfortable to use for assessing the flexibility of the spinal curve in AIS patients.

DISCLOSURE

No conflicts of interest were declared by the authors.

REFERENCES


Figure 3  The correct positioning of the fulcrum under the apex of the (a) thoracic and (b) lumbar curves is verified by comparing the standing anteroposterior radiographs and fulcrum bending radiographs.


