Endoscopic Woodward procedure for Sprengel deformity: case report

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Sprengel deformity (SD) results in a limitation of movement of the shoulder girdle and produces an esthetic defect. Our aim is to assess the feasibility and advantages of a minimally invasive endoscopic approach for SD correction. A 4-year-old boy with a Cavendish grade III right SD. The patient underwent an endoscopic Woodward procedure with access through two small incisions at the level of the upper and lower angles of the scapula. Near-symmetrical shoulder elevation was achieved, with an excellent cosmetic result. The endoscopic Woodward procedure is a feasible, effective, and minimally invasive technique in the treatment of SD. Level of Evidence: V. *J Pediatr Orthop B* 26:266–269

Journal of Pediatric Orthopaedics B 2017, **26**:266–269

Keywords: endoscopy, Sprengel deformity, Woodward procedure

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Introduction

Sprengel deformity (SD) is a congenital condition characterized by a dysplastic scapula in a higher-than-normal position and rotated inward, resulting in limitation of shoulder girdle movement and an esthetic defect [1–3]. Several procedures for lowering the scapula have been proposed, to improve physical appearance and function in these patients [2,4,5]. The procedures described previously have all required extensive exposure and soft tissue release to enable descent of the scapula.

The Woodward procedure is one of the most universally used techniques for treating this disorder, owing to its excellent clinical results [5–8]. We present a Cavendish III SD in a 4-year-old boy treated with the Woodward procedure, but utilizing a dry endoscopic approach.

Case report

A 4-year-old boy with a right SD, classified as grade III according to Cavendish, and Rigault grade II [9] (Fig. 1), presented to us. There were no associated anomalies.

On examination, the patient showed active shoulder elevation limited to 90° after trunk stabilization (Fig. 1). The right scapular spine was elevated by 4 cm compared with the left side. A computed tomography scan showed that no omovertebral bone was present, nor any spinal or costal abnormalities (Fig. 1).

A Woodward procedure using an endoscopic approach was planned. The patient was placed in a prone position under general anesthesia. Passive glenohumeral abduction measured 80° (similar to the contralateral side), whereas passive right-side scapulothoracic elevation was 10° versus 90° on the contralateral side. Right scapular passive downward translation measured 0 cm compared with 4 cm contralaterally, Supplementary Video 1, Supplemental digital content 1, *http://links.lww.com/JPOB/A19* and Supplementary Video 2, Supplemental digital content 2, *http://links.lww.com/JPOB/A20*.

A 2 cm incision was made over the inferior border of the trapezius muscle, palpable at the level of T9 (Fig. 2a). After skin and subcutaneous incision, the lower border of the trapezius was identified. The trapezius was vertically tractioned and separated from deeper planes with a long-tongue Farabeuf retractor to create a working chamber suitable for dry endoscopy (Fig. 2b). A 4 mm arthroscope was introduced, enabling visualization of the trapezius and the spinal accessory nerve in the superficial layer (Fig. 2c), as well as the rhomboid muscle in the deep layer.

A second 2 cm incision was made at the level of the superior angle of the scapula, and subcutaneous tissue was dissected. The trapezius' muscle fibers were split transversely between its upper and middle portion to identify and protect the accessory spinal nerve. The arthroscope, introduced through the distal portal, aided in locating the correct plane beneath the trapezius muscle. Once the plane was identified, a second long-tongue Farabeuf was used to elevate the trapezius.

During the dry endoscopy procedure, the assistant applied upward traction with both Farabeuf retractors. A

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Fig. 1

Clinical picture and computed tomography scan showing a Cavendish III Sprengel deformity with restricted shoulder elevation limited to 90° after trunk stabilization.

Fig. 2

Two 2-cm portals, distal and proximal, were used for the endoscopic procedure; the portals allowed placement of Farabeuf retractors to create a dry working chamber by vertical traction (a, b). The endoscope enabled visualization of the subtrapezius (Tz) space so that the muscle could be detached from the spinous processes (SP) (c). After muscle release, scapulothoracic passive range of motion was restored (d).

Fig. 3

Functional result 15 months after the endoscopic Woodward procedure.

hooked electrocautery (SERFAS Energy Hook Probe; Stryker, Kalamazoo, Michigan, USA) was introduced through the proximal portal to release the origins of the trapezius and rhomboid from the spinous processes (Fig. 2c). Next, the upper trapezius was released. The upper retractor was turned proximally to elevate the proximal trapezius and the endoscope was reintroduced through the proximal portal. At the same time, the electrocautery was introduced through the distal portal.

In a third step, a proximal approach was adopted, detaching the levator scapulae muscle from the scapula, and excising its dysplastic superior angle. Next, the scapula's attachments to the thorax were released using blunt dissection and the scapula was lowered.

Following release, passive glenohumeral elevation increased to 90°, whereas global elevation reached 160° (Fig. 2d). The scapula's passive vertical translation was markedly increased, Supplementary Video 3, Supplemental digital content 3, *http://links.lww.com/JPOB/A21* and Supplementary Video 4, Supplemental digital content 4, *http://links.lww.com/JPOB/A22*.

The final step, performed through a distal approach, consisted of fixation of the scapula's inferior border by suturing it to the spinous processes using no. 2 polyester suture. The relative heights of the scapular spines were thus equalized (Figs 2 and 3).

The patient was discharged 20 h after the surgery. The upper limb was immobilized with a sling for the next 3 weeks, after which therapy was initiated. No complications were noted.

Active shoulder elevation 4 months after surgery was 160°. The right scapular spine remained elevated by 0.5 cm in comparison with the contralateral side (Fig. 3). Examination at 12 months following surgery showed similar positioning.

Discussion

A minimally invasive approach to performing a Woodward procedure proved both feasible and effective in lowering a scapula affected by SD and resulted in improved shoulder elevation and cosmetic appearance.

The Woodward [5] procedure, described in 1961, corrects congenital mis-elevation of the scapula by repositioning the origins of the trapezius and rhomboid muscles downward, following resection of the omovertebral bone or anomalous fibrous bands (when present). The scapula's dysplastic superior angle is also resected, allowing release of the levator scapulae muscle and any fibrous bands or omovertebral bone limiting scapular movement. The standard Woodward procedure takes an open approach, with a long skin incision extending from the occiput to the T12 spinous process, and extensive soft tissue detachment [5–8]. A less invasive procedure could offer the advantages of reduced postoperative pain, shortened hospital stay, lowered infection rate, fewer wound complications, and reduced recovery time, as well as superior cosmetic results [10].

In the standard Woodward procedure, trapezius and rhomboid muscle origins are sutured more caudally to secure the scapula in its new position [5–8]. In our technique, released muscles were not reinserted; instead, the scapula was stabilized with thick absorbable suture. This strategy proved adequate to maintain the scapula's surgically corrected position over time.

In light of the results obtained, we consider the endoscopic Woodward procedure to be a promising technique. A comparative prospective study will be necessary to compare this technique's clinical and esthetic outcomes, complications, and cost-effectiveness with those of the traditional open approach.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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