PEDICLE SCREW IMPACTATION IN THE AORTA AFTER DIRECT VERTEBRAL ROTATION

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INTRODUCTION

Thoracic pedicle screw implants are accepted as sufficient to firmly secure the correction of spinal deformities, but they are not free of complications. Plowing is defined as the structural failure of the pedicle screw for the shift in the transverse plane during manoeuvres direct vertebral rotation (DVR)

Aorta was positioned more lateral and posterior from 5th to 12th thoracic level in patients with scoliosis¹
Pedicle characteristics as rotation, dysplasia, and length of pedicle make weak for maneuvers²

Screw placed lateral and less bone quality increase risk of plow³

**DIRECT VERTEBRAL ROTATION (DVR)**

After adequate placement of the screws patients underwent DVR consisting of placement of derotation tubes on short segments and starting away the apical region toward the apex.

The rotational force is transmitted through the pedicle screws and it may failure and translates the screw perpendicular to its long axis.

**MATERIAL AND METHODS**

We present a multicenter and retrospective review on 355 pediatric patients who underwent instrumentation with screws with neuromuscular and idiopathic scoliosis from 2004 to 2009. All of them underwent routine postoperative CT scan (currently performed only under suspect)
8 patients (2.2%) had lateral displacement of a screw after DVR in apex and concavity of the curve. 4 females and 4 males (mean age 14 +7 years). Adequate screw placement was confirmed via fluoroscopy or radiography.

The most frequent level affected was left T9 and cases are showed in table below.

### Table 1

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age at surgery (yrs+months)</th>
<th>Sex</th>
<th>Scoliosis Type</th>
<th>Levels of posterior spinal instrumentation</th>
<th>Plowed screw</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14+5</td>
<td>Male</td>
<td>AIS</td>
<td>T2-L3</td>
<td>Left T12</td>
</tr>
<tr>
<td>2</td>
<td>16+3</td>
<td>Male</td>
<td>AIS</td>
<td>T2-L3</td>
<td>Left T7</td>
</tr>
<tr>
<td>3</td>
<td>9+5</td>
<td>Female</td>
<td>JIS</td>
<td>T5-L3</td>
<td>Left T9</td>
</tr>
<tr>
<td>4</td>
<td>11+9</td>
<td>Male</td>
<td>NMS</td>
<td>T2-pelvis</td>
<td>Right L3</td>
</tr>
<tr>
<td>5</td>
<td>13+11</td>
<td>Female</td>
<td>NMS</td>
<td>T3-pelvis</td>
<td>Left T9</td>
</tr>
<tr>
<td>6</td>
<td>16+4</td>
<td>Male</td>
<td>AIS</td>
<td>T2-L1</td>
<td>Left T9</td>
</tr>
<tr>
<td>7</td>
<td>12+6</td>
<td>Female</td>
<td>AIS</td>
<td>T2-L3</td>
<td>Left T7</td>
</tr>
<tr>
<td>8</td>
<td>15+8</td>
<td>Female</td>
<td>AIS</td>
<td>T2-L3</td>
<td>Left T8</td>
</tr>
</tbody>
</table>

*AIS indicates adolescent idiopathic scoliosis; JIS, juvenile idiopathic scoliosis; NMS, neuromuscular scoliosis.*

### RESULTS

Revision surgery was performed in the 2th-3rd PO day. No cases with suspected aortic laceration or rupture. A cardiac surgeon or interventional radiologist was notified.

In the revision surgery the screw was removed after cutting the bar and replaced bar with straight connector.
These patients did not present further complications in the next two years of follow-up.
CASE 8

This patient is a female 15 years and 8 months old who underwent surgery for idiopathic scoliosis type 6CN (Lenke’s classification)

Preoperative studies
Postoperative radiographs. We can appreciate that the left T8 pedicle screw was lateral to the vertebral body.

In the intraoperative fluoroscopy this screw seems inside vertebral body, but CT scan confirmed its bad position.
CT scan showed pedicle screw impactation in the aorta.

Picture shows previous hole before “plowing” of the screw.
Radiographs after revision surgery
CONCLUSION

The segmental vertebral derotation manoeuvre can be cause plowing in appropriately placed screws, breaking the lateral cortex at the maximum correction attempt.

The apex of the concavity of the curves is the area of greatest risk because high rotation, dysplasia of the pedicle and the proximity of the aorta.

It seems necessary verify the correct placement of pedicle screws after direct vertebral rotation manoeuvres. It is difficult to detect this type of problem during surgery.

We can decrease incidence of lateral screw plow using multilevel group derotators.

DISCLOSURE

None of the authors has any potential conflict of interest.

REFERENCES


