

Are Rib Versus Spine Anchors Protective Against Breakage of Growing Rods?

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Abstract

Study Design: Retrospective multicenter, case-control study.

Objective: To compare the risks of rod breakage and anchor complications between distraction-based growing rods with proximal spine versus rib anchors.

Summary of Background Data: Rod breakage is a known complication of distraction-based growing rod instrumentation.

Methods: A total of 176 patients met inclusion criteria: minimum 2-year follow-up, younger than age 9 years at index surgery, non-Vertical Expandable Prosthetic Titanium Rib distraction-based growing rods, and known anchor locations. Mean follow-up was 56 months (range, 24–152 months). Survival analyses using Cox proportional hazards model (accounting for varying lengths of follow-up) of rod breakage, anchor complications, preoperative Cobb angle, number of growing rods, age, and number of levels instrumented were performed using a significance level of $p < .05$.

Results: Thirty-four patients had rib-anchored growing rods and 142 had spine-anchored growing rods. This analysis found that proximal rib-anchored growing rods have a 23% risk of lifetime rod breakage compared with spine-anchored growing rods (6% vs. 29%) ($p = .041$) without a significant increase in risk of anchor complications (38% vs. 33%) ($p = .117$). The number of implanted rods ($p = .839$), age ($p = .649$), and number of instrumented levels ($p = .447$) were not statistically significant regarding rod breakage risk, although higher preoperative Cobb angles were significant ($p = .014$).

Conclusions: Preoperative Cobb angle appears to be the most influential factor in determining whether growing rods break ($p = .014$). Univariate analysis found that rib anchors were associated with less than one-fourth the risk of rod breakage than spine anchors ($p = .04$) but multivariate analysis found no significant association between anchors and rod breakage ($p = .07$). This trend suggests that rib-anchored growing rod systems may be associated with less rod breakage because the system is less rigid as a result of some “slop” at the hook–rib interface, as well as the normal motion of the costovertebral joint.

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Keywords: Rod breakage; Distraction-based growing rods; Complications; Anchors

Introduction

Rod breakage is a well-documented complication of spinal instrumentation without fusion (growing rods). Since their introduction in 1984 by Moe et al. [1], there have been a few studies evaluating the risk factors involved in rod breakage [2]. To date, there have been no studies to evaluate the effect of spine versus rib anchors on the risk of rod breakage. The purpose of this study was to evaluate whether there is a difference in the risk of rod breakage between proximally based spine and rib anchors.

Materials and Methods

This was a retrospective, multicenter study of subjects who underwent spinal growing rod implantation surgery from 1990 to 2010. The patient population was obtained through a multicenter early-onset scoliosis database. The researchers obtained institutional review board approval from all sites and followed all protective measures.

Inclusion criteria for the study were that subjects had growing rod implants, were aged less than 9 years at index surgery, had a minimum of 2 years of follow-up from index surgery, and had recorded information of proximal and distal growing rod anchors. The authors included growing rods with proximal spine anchors and proximal rib anchors and excluded Vertical Expandable Prosthetic Titanium Rib implants, subjects with Jeune syndrome, and subjects with Jarcho–Levin syndrome (Figs. 1 and 2).

The researchers performed a retrospective review of the collected clinical data and radiographs. Data collected

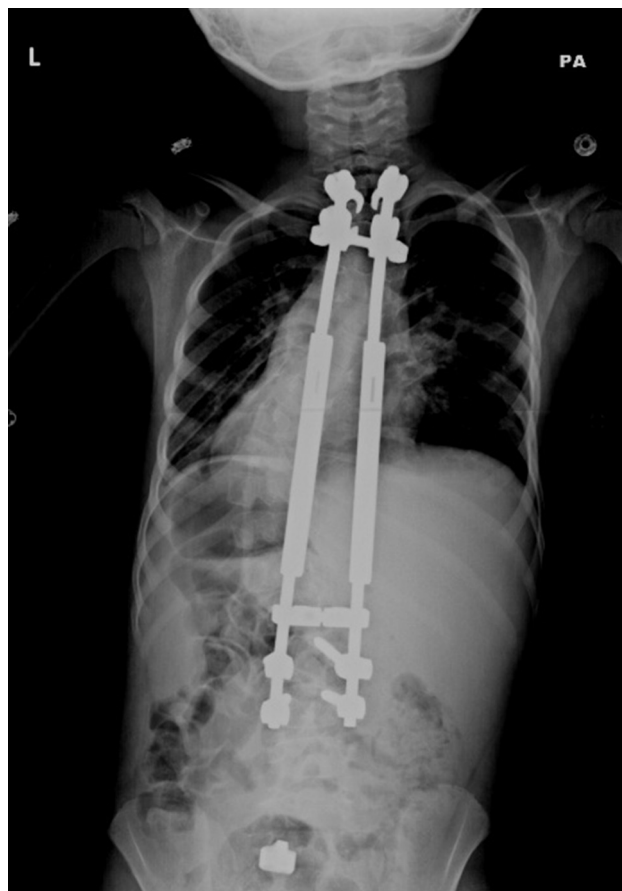


Fig. 1. Posteroanterior (PA) radiograph of a patient with proximal spine anchors.

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