

Quantity and Quality of Motion in Stenosis Patients

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Introduction

The quantity (flexion-extension motion) and quality (interpedicular travel) of motion is well studied in younger patients [1] but quality of motion is unreported for older patients. Wharton studied patients averaging 40 years of age; the typical stenosis patient is reported to be in their 60's [2]. The purpose of this study is to measure the quantity as well as quality of flexion-extension motion in preoperative patients about to undergo surgical treatment for lumbar spinal stenosis, based on radiographic analysis.

Methods

Maximum voluntary flexion-extension radiographs were obtained preoperatively from 70 patients as part of an ongoing IDE study of a pedicle screw based dynamic stabilization device. All patients were being treated at a single level. The radiographs included a calibration marker to account for radiographic magnification. The flexion and extension radiographs were assessed using validated, computer assisted methods accurate to better than 1° and 1 mm. Interpedicular distance was measured between the mid-pedicular axes of adjacent vertebrae using points slightly posterior to the superior articular process of each vertebra, representing the typical location of the junction between the posterior rod and pedicle screw in dynamic systems. Range of Motion (ROM) was measured as the change in angle between adjacent endplates of the index level from Flexion to Extension. Interpedicular travel (IPT) was calculated as the change in interpedicular distance from Flexion to Extension. ROM and IPT were measured at the index level.

Results

The average age of the patients was 58 years of age (range: 35-82). There were 31 males and 39 females. **The L4-L5 level represented 78% of the index levels**, with remainder at L5-S1, L3-L4 and L2-L3. The ROM and IPT were non-normally distributed, so medians and range are reported. **The median ROM at the index level was 3.5° (range 13.1°). The median IPT at the index level was 2.3mm (range 10.5mm). There was a statistically significant linear correlation between ROM and IPT ($R^2=97\%$) and the ratio of median IPT/ROM was 0.66.**

Discussion

As expected, the magnitude of flexion/extension ROM and IPT of stenotic patients prior to surgery was significantly less than reports of measurements from younger patients (13.6° ROM and 9.2mm IPT from Wharton). Interestingly, the ratio of IPT/ROM is similar in the two populations (0.66 in the current study, 0.68 based on Wharton). This data may be useful in designing or evaluating different dynamic stabilization systems used as an adjunct for treating spinal stenosis.

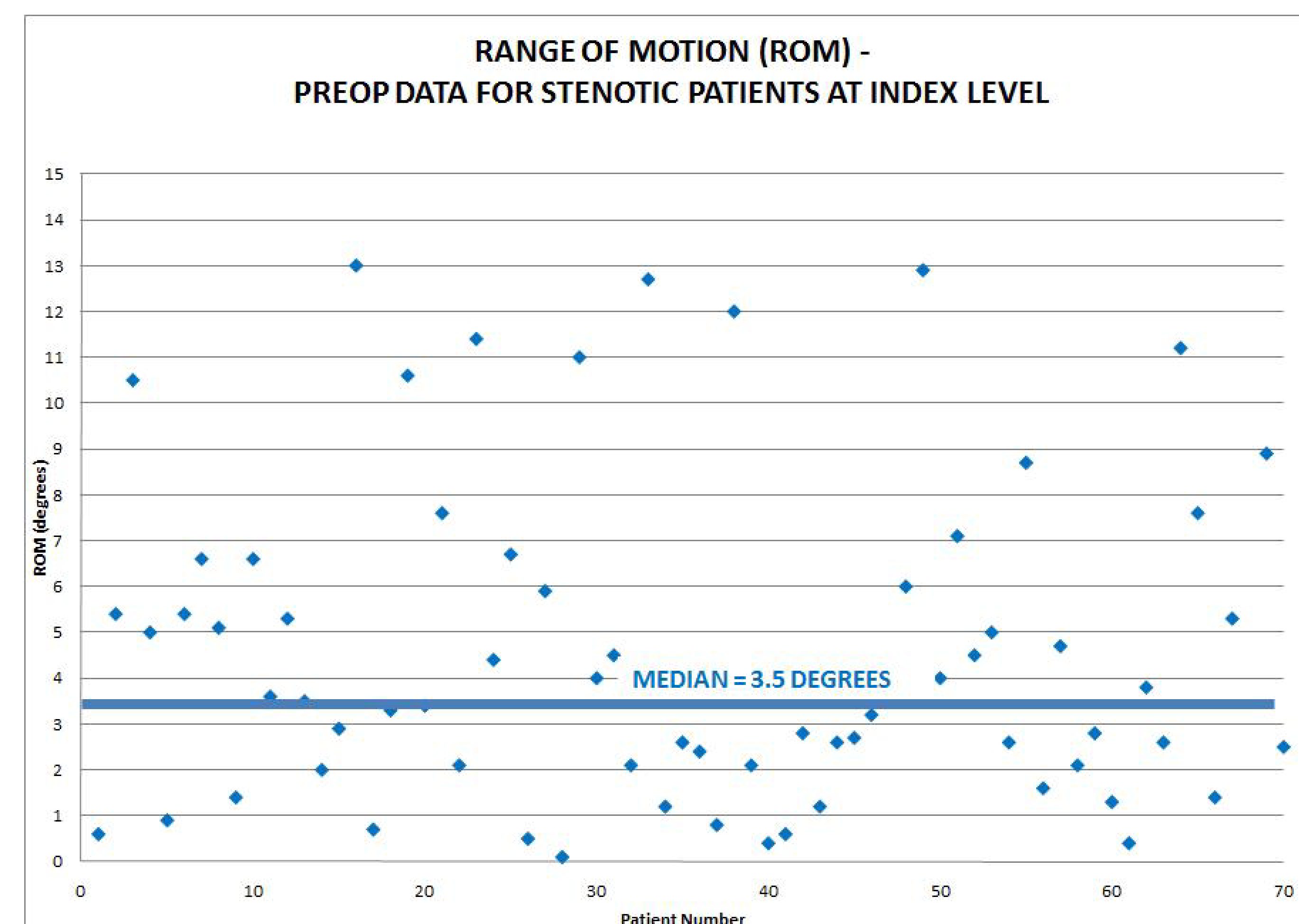


Figure 1. PreOp ROM distribution for 70 stenotic patients

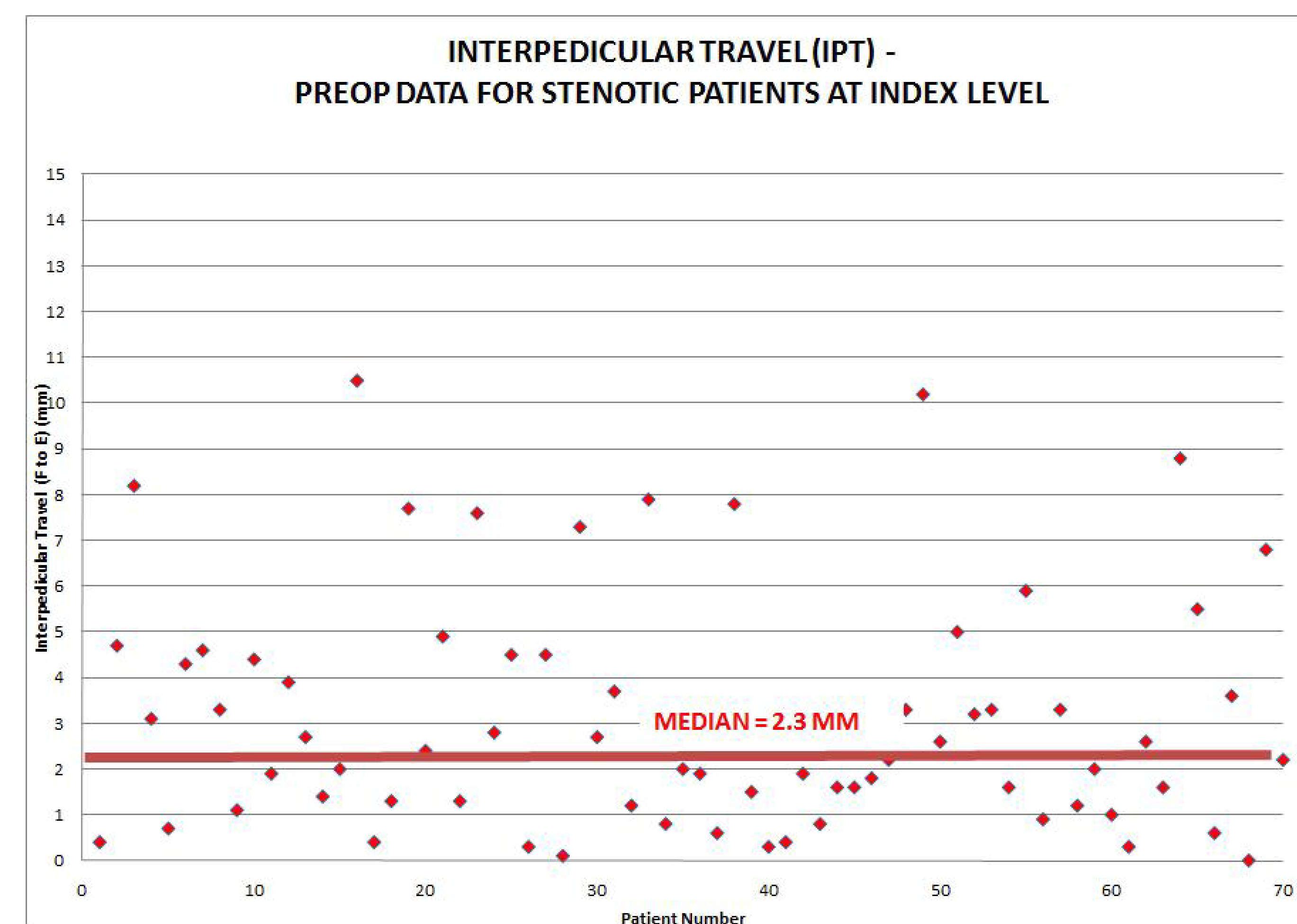


Figure 2. PreOp IPT distribution for 70 stenotic patients

REFERENCES

1. Wharton N, et al., *Assessment of Normal Interpedicular Motion in Flexion-extension X-rays of the Lumbar Spine*. Spine Arthroplasty Society Conference, 2009. Abstract 516.
2. Castellvi AE, et al., *The Total Facet Arthroplasty System (TFAS) in the Treatment of Spinal Stenosis: Worldwide Experience with Longest Follow-up of 36 Months*. Spine Arthroplasty Society Conference, 2009. Abstract 269.