



THE IMPACT OF REVISION OF ONE OR MORE NON-FUSION SPINAL RODS ON THE RE- FRACTURE RATE AND IMPLANT SURVIVAL FOLLOWING ROD FRACTURE

Michael David, Adrian Gardner, Toby Jennison,

Jonathan Spilsbury & David Marks

The Royal Orthopaedic Hospital, Birmingham (UK)

ICEOS, 16 November 2012

DISCLOSURES

Michael David – none

Adrian Gardner

- educational contracts with Medtronic and Depuy-Synthes
- research support: Medtronic

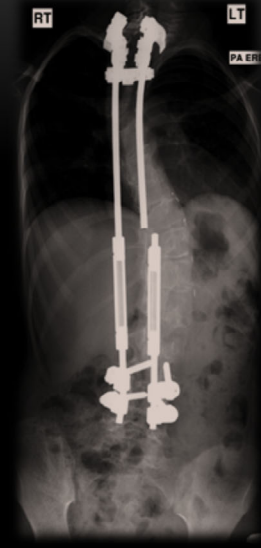
Toby Jennison – none

Johnathan Spilsbury – none

David Marks

- consultancy agreements with Depuy-Synthes, Medtronic and Stryker
- speaker bureau: Depuy Synthes, K2M, Medtronic & Stryker
- Royalties: Depuy Synthes

- non-fusion rods control scoliosis & facilitate growth
- spontaneous rod fractures recognised
- options:
 - repair
 - replace broken rod (single)
 - replace broken and unbroken rods (2+)
- changing whole construct more invasive surgery (pain, infection risk, blood loss?)



Growing rods used in the treatment of childhood scoliosis may break. Options include repair using a longer connector, replacing just the broken rod, or replacing broken and unbroken rods. Changing just the broken rod entails less invasive surgery, and may reduce blood loss and pain.

QUESTION

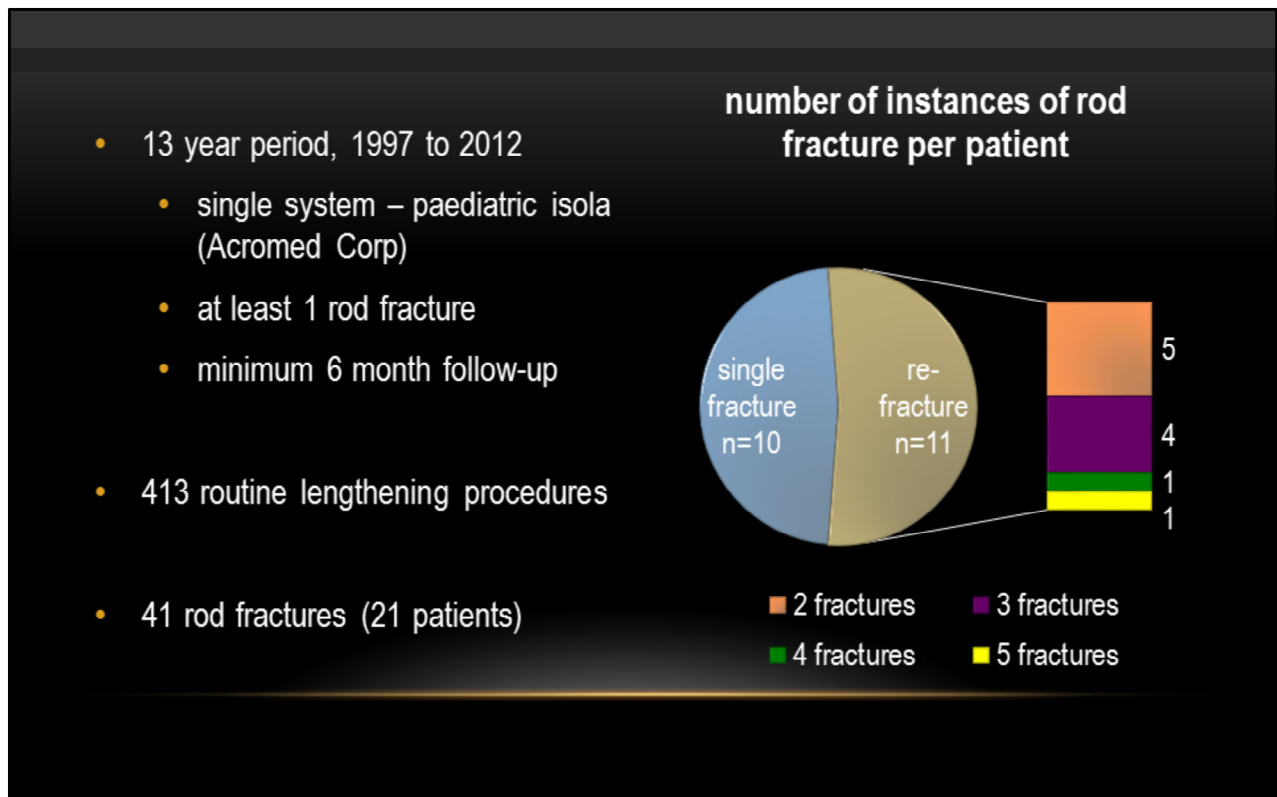
does replacing all rods lead to better overall implant survival after revision for rod fracture?

But the question remains following replacement of the broken rod, whether then changing the unbroken rods improves overall implant survival.

END POINTS

1. further fracture of any rod
2. lead time to re-fracture

We reviewed treated rod fractures in terms of any further breakage, and the lead time before re-fracture.



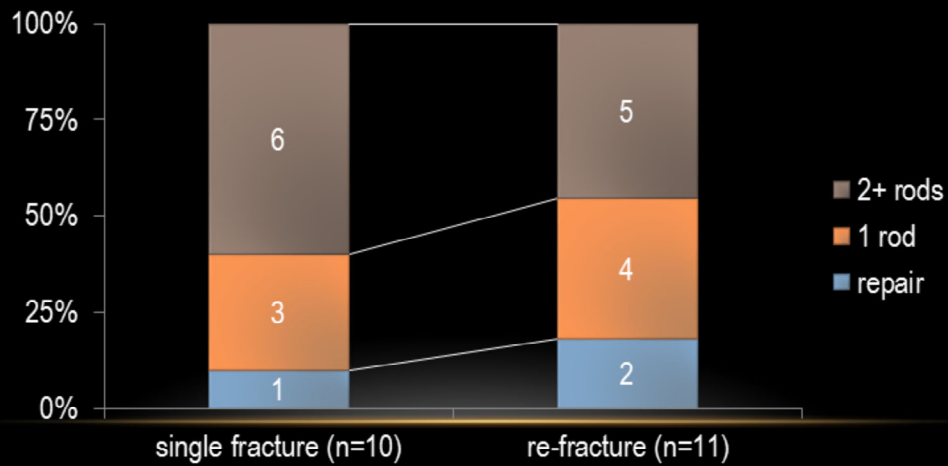
We identified and assessed patients with a rod fracture over a 13 year period. Inclusion criteria included:

- scoliosis treated with the Paediatric Isola system
- at least one rod fracture
- and a minimum 6 months follow-up from the last revision.

During the study period, there were 413 routine lengthenings, but only 41 rod fractures in 21 patients.

The chart shows the number of rod fractures experienced by a patient –under half had just one fracture, and a similar number sustained 2 or 3.

choice of treatment following 1st fracture in single and re-fracture patient groups

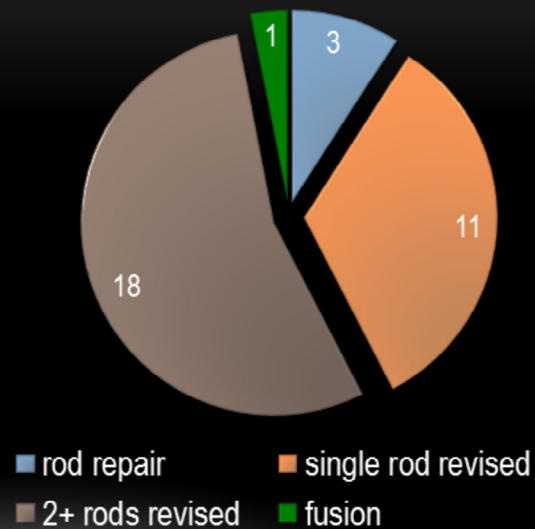


The bar chart looks at the treatment following an initial rod fracture: in the group without re-fracture 60% were treated by revising both broken and unbroken rods, whereas unbroken rods were changed in 45% in the re-fracture group. There is no statistical significance between any of the treatment choices shown.

SINGLE-SIDE ROD FRACTURES n=33

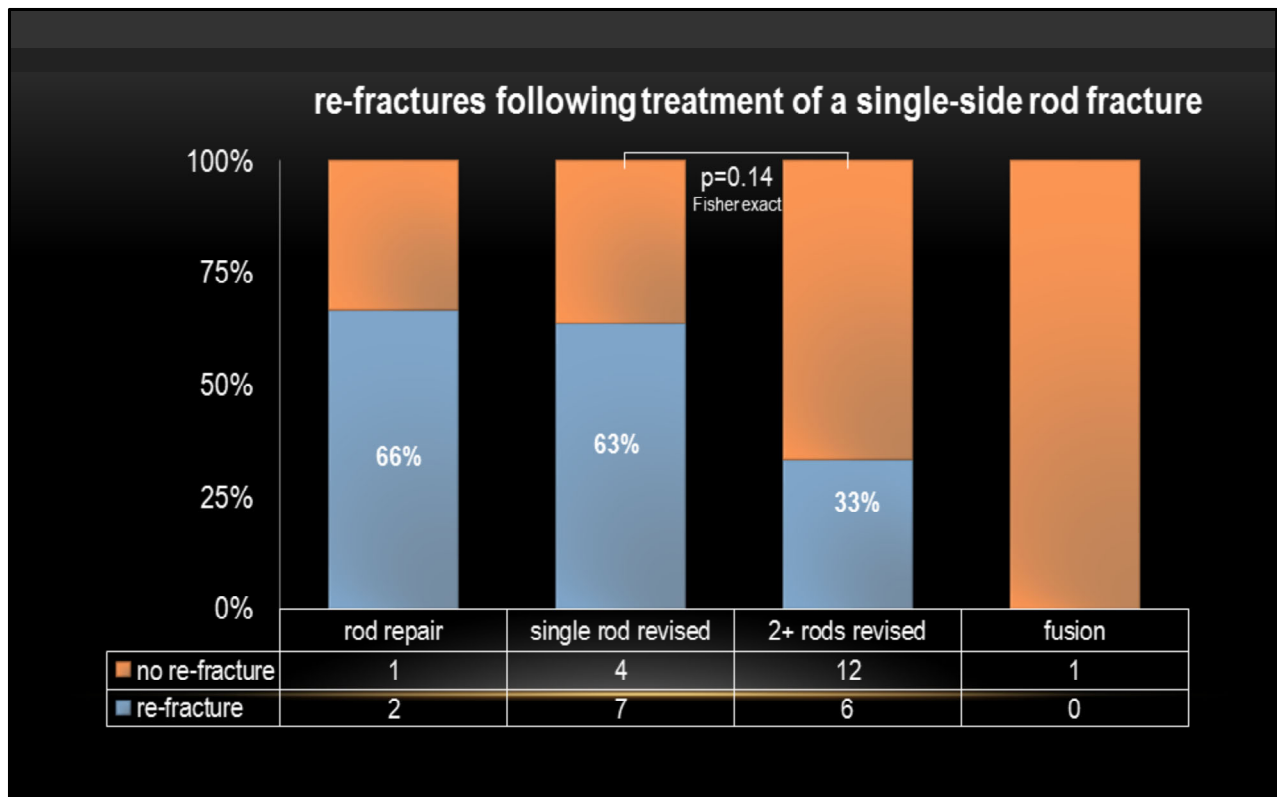
further fractures n=15

same rod re-fracture
n=12 (80%)



There were 33 instances of rod failure involving just one rod. Following treatment, there were 15 further fractures – but these re-fractures occurred in the same rod in 80%.

The pie-chart shows the proportion of single-rod fractures treated by repair (in blue), single rod revision (orange), revision of both broken and unbroken rods (the majority in brown), and definitive fusion (in green).



The next chart depicts re-fracture rates by treatment choice, with the table summarising the actual numbers. Two thirds of repairs failed, but the sample is too small to test significance. Compared with revising just the broken rod, revising the unbroken rods as well, almost halves the relative risk of further fracture from 63 to 33%. But this does not quite reach statistical significance.

LEAD TIME TO RE-FRACTURE FOLLOWING TREATMENT OF A SINGLE ROD FRACTURE

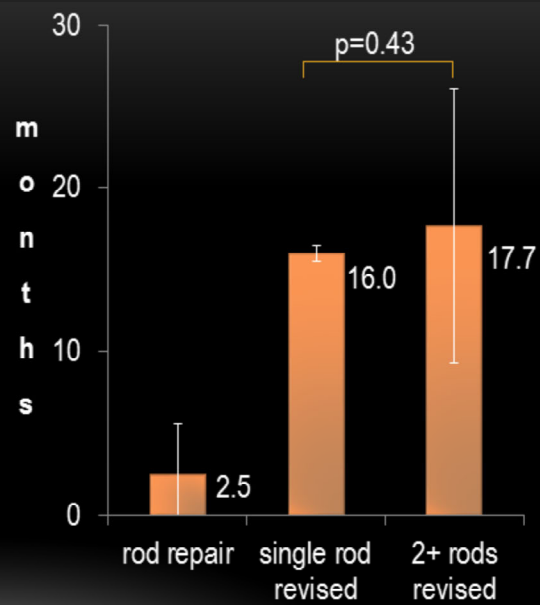
single rod revision

vs.

2+ rods revised

mann-whitney u, $p=0.43$

no statistical difference



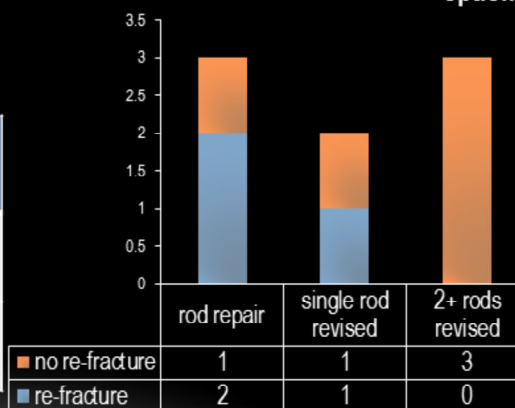
Equally there was little difference in the lead time to further fracture when comparing single rod revision with revision of the unbroken rods as well. The small sample of rod repairs fared poorly.

NEUROMUSCULAR SCOLIOSIS

- 11 rod fractures in 6 patients

	single rod fracture group	neuromuscular sub-group
patients	18	5
re-fractures	9 (50%)	3 (60%)

breakdown of re-fractures by treatment option



We performed a sub-group analysis on neuromuscular scoliosis patients within the single-rod fracture population. There was little difference in re-fracture rate, and the trend remained for better implant survival with revision of the unbroken rods in addition to the fractured rod, but there was no concrete significance.

SUMMARY

- rod repair not recommended as leads to early unplanned surgery (*unless as a temporary solution if implants not available*)
- revising both sides of construct may lower re-fracture, but...
 - no difference in timeframe
 - usually the same broken rod re-fractures (80% of episodes)
- **unit protocol is to revise the broken rod for a first time single-rod fracture, and thereafter revise all 4 rods for any re-fracture**

Rod repairs using longer connectors to bypass a broken rod are not recommended as it leads to early-unplanned surgery. Revising unbroken rods along with the broken rod after a single-rod fracture may lower the incidence of further fractures, but...

- this has not reached significance with our current numbers
- the re-fracture rate is only 45%
- it doesn't affect survival time in those who proceed to re-fracture
- and in 80%, the re-fracture anyway involves the very same rod.

Therefore our unit protocol is to revise just the broken rod for a first time single-rod fracture, and thereafter revise all 4 rods for any re-fracture.