Low-dose CT: a safe and effective imaging modality in post-operative pelvic & acetabular fixation

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Introduction

Post-operative pelvic & acetabular fixation patients are conventionally imaged using 3-view radiographs (AP, inlet and outlet or Judet views). The efficacy of such radiographs is inconsistent due to technical difficulties capturing an adequate view, often necessitating repeat radiographs and therefore increasing radiation exposure. Moreover, even high-quality radiographs can be difficult to interpret, limiting the assessment of fracture reduction and fixation, especially with respect to metalwork positioning around articular surfaces. Traditionally, patients will have 7 encounters with 3-view pelvic X-rays. Our new pathway consists of one post-operative low-dose pelvic CT, followed by 6 encounters with 1-view X-rays.

Aim

To create a new imaging pathway for post-operative pelvic & acetabular fixation patients with a lower radiation burden, higher quality images and easier implementation (for both patients and clinicians).

Method

A new pelvic CT protocol was created to provide high quality 3D imaging whilst delivering a 5 times lower radiation dose (compared to standard pelvic CT). Data for all pelvic radiographs and CTs (42 patients) between January 2021-March 2022 was exported from Soliton. Using recorded patient dose indicators, effective radiation dose and attributable lifetime cancer risk were calculated for comparison.(1)

Radiation doses

1-view pelvic X-Ray: **0.2mSv**

3-views pelvic X-ray: **0.6mSv**

Standard pelvic CT: **5.5mSv**

Low-dose pelvic CT: **1.1mSv**

Results

Traditional pathway:

7 encounters x 3-views pelvic X-ray

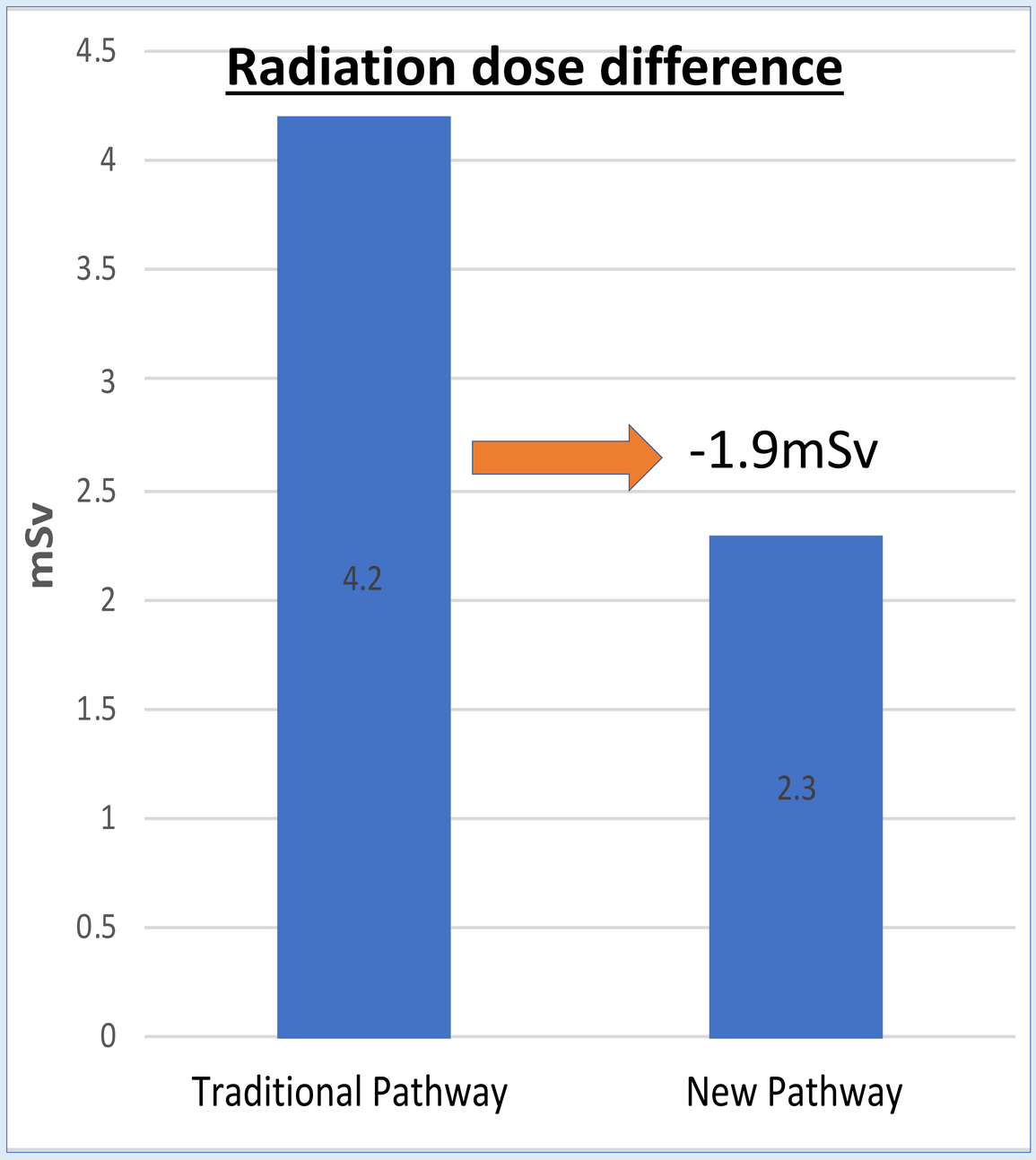
→ 7 x 0.6mSv = **4.2mSv** *(1 in 11,000 cancer risk)*

New pathway:

Low-dose post-op CT + 6 visits with 1-view pelvic X-ray

→ 1.1mSv + (6 x 0.2mSv) = **2.3mSv** *(1 in 20,000 cancer risk)*

45% relative cancer risk reduction with new pathway



Conclusion

The new pathway (one low-dose pelvic CT in conjunction with 1-view radiographs) is an effective and safe imaging modality in the post-operative assessment of pelvic & acetabular fracture fixation, conferring a lower radiation burden, easier logistics of obtaining images, and higher quality images when compared to the traditional pathway of 3-view radiographs. There is a 45% relative risk reduction with respect to cancer risk when using the new pathway.

References:

(1) Wall, B. F., Haylock, R., Jansen, J. T., Hillier, M. C., Hart, D., & Shrimpton, P. C. (2011). *Radiation risks from medical X-ray examinations as a function of the age and sex of the patient.* Health Protection Agency.