A comparative study of radiation dose and screening time between mini C-arm and standard fluoroscopy in elective foot and ankle surgery

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Objective

This study compares the radiation dose delivered and screening times used between standard fluoroscopy and the mini C-arm during foot and ankle surgery. It also provides an estimate of potential cost savings in GBP as of 2009.

Method

- 127 cases who required intra-operative screening during various elective foot and ankle procedures were prospectively reviewed. Mini C-arm (Hologic, InSight 2) was used in 55 patients and was surgeon operated. Standard fluoroscopy (Siremobil 2000, Siemens Medical Systems) in 72 patients and was radiographer operated.
- Dose Area Product (DAP) was used as a measure of dose.
- Costs of standard fluoroscopy was determined by calculating the cost of providing a radiographer to theatre as well as the cost of delays to theatre caused by radiographer in attendance. Radiographer cost as £30/h. Mini C-arm cost was £42,500. Cost of theater time £15/min. Surgeon mini c-arm training cost was £350 each.

Results

There was a statistically significant reduction in mean DAP using the mini C-arm, 3.46 Gy cm2 vs 7.43 Gy cm2 (P = 0.0013). Table below shows the procedures and the DAP values for standard and mini c-arm fluoroscopy. There was no statistical difference in screening time.

A comparison of dose area product (mGy cm2) in different foot and ankle surgeries using conventional fluoroscopy or mini C-arm

	Device			
	Standard Fluoroscopy		Mini C-arm	
	Frequency	DAP	Frequency	DAP
Forefoot procedures	21	2.9	19	2.36
Steriod injection	16	7.56	17	3.87
Examination of anesthesia of ankle	15	4.75	7	2.77
Hindfoot procedures	14	26.9	10	4.40
Subtalar arthrodesis	5	6.60	2	8.14
All procedures	71	5.90	55	3.32

The saving that could potentially be associated in 2009 with not using radiographers for extremity procedures is £5541 in radiographer delays and £3840 in radiographer salaries. The annual savings in 2009 from using the mini C-arm could be £9391, saving the total cost of the device over 5 years.

Conclusion

- Mini C-arm use in elective foot and ankle surgery gave a significant reduction in radiation use when compared to standard fluoroscopy. No statistically significant difference was observed between the screening times for the two groups. The introduction of a mini C-arm potentially reduces the cost and its use is recommended in foot and ankle surgery.