

# RADIATION TO PATIENTS DURING DYNAMIC HIP SCREW SURGERY

Zaka Ullah Khan<sup>1</sup>, Javaid Iqbal<sup>2</sup>, Selvaraj Aravindan<sup>3</sup>

## ABSTRACT

**Objective:** The aim of this study was two fold. To determine the diagnostic reference level (D.R.L.) dose of radiation during dynamic hip screw (D.H.S.) fixation and, to audit the orthopaedic department against this standard.

**Methods and Materials:** A retrospective analysis of 112 consecutive patients between 31<sup>st</sup> December 2002 and the 6<sup>th</sup> July 2003, at Darenth Valley Hospital, Dartford, under going dynamic hip screw fixation for proximal femur fractures was carried out. The data was collected from the Radiographers log. The screening time and Dose Area Product (DAP) for each event was analyzed in conjunction with the Radiation Protection Department at Kings College, London. Taking the 75<sup>th</sup> percentile from the existing data, the DAP was set at 1.05cGy/cm<sup>2</sup>. The screening time for the procedure was set at 64.2 seconds. An audit to assess the performance of the orthopaedic department against these standards was carried out. All grades of surgeons performing this procedure were included in the audit.

**Results:** In the total of 112 patients, there were 32 males and 80 females. The age range was from 27 to 99 years with a mean of 83.96 years. Sixty fractures were on the right side and 52 on the left. The total screening time for the procedures was 78.25 minutes with an average of 0.877 of a minute (i.e.) 52.62 seconds. The total Dose Area Product (DAP) was 96.42cGy/cm<sup>2</sup> with an average of 0.860cGy/cm<sup>2</sup>.

**Conclusion:** At present there are no DRL for orthopedic procedures locally or nationally in the United Kingdom, despite this being a legal requirement since May 2000. The authors have determined a local DRL for DHS fixation which can be used as a guideline for this procedure. We recommend that DRL be set for other orthopedic procedures done under Fluoroscopic guidance, especially procedure involving younger patient.

**KEY WORDS:** Dynamic Hip Screw (D.H.S.), Diagnostic Reference Level (D.R.L.), Screening time, Dose Area Product (D.A.P.), Surgical Audit.

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## INTRODUCTION

Use of fluoroscopy is common practice in orthopaedics. Although many researches have been carried out to identify the safety precautions needed to prevent serious complication from radiation, little has been done to limit the radiation to the patients.

There is a current drive towards establishing reference doses for radiological procedures with the aim to optimizing patient dose. Furthermore, the establishment of diagnostic reference doses (DRL) became legal requirement for all hospital on the 13<sup>th</sup> May 2000.

Specialities like Urology, Cardiology and Radiology have defined such D.R.L.s. However, Orthopaedics, a specialty in which

fluoroscopy is used the most, lags behind. To our knowledge, there are no known D.R.L. in the United Kingdom for orthopaedics fluoroscopic procedures, either at local or national levels. The aim of this study was two fold. To determine the diagnostic reference level dose of radiation during dynamic hip screw fixation and to audit the performance of our orthopaedic department in achieving this standard.

### PATIENTS AND METHODS

A retrospective analysis of 112 consecutive patients between 31<sup>st</sup> December 2002 and the 6<sup>th</sup> July 2003, at Darenth Valley Hospital, Dartford, under going dynamic hip screw fixation for proximal femur fractures was carried out. The data was collected from the Radiographer's log. The screening time and Dose Area Product (DAP) for each event was analyzed in conjunction with the Radiation Protection Department at Kings College, London. Taking the 75<sup>th</sup> percentile from the existing data, the DAP was set at 1.05c Gy/cm<sup>2</sup>. (Fig-1 )

By the same process the screening time for the procedure was set at 64.2 seconds (Fig-2). An audit to access the performance of the orthopaedic department against these standards was carried out. All grades of surgeon performing this procedure were included in the audit.

### RESULTS

In the total of 112 patients, there were 32 males and 80 females. The age range was from 27 to 99 years with a mean of 83.96 years. Sixty

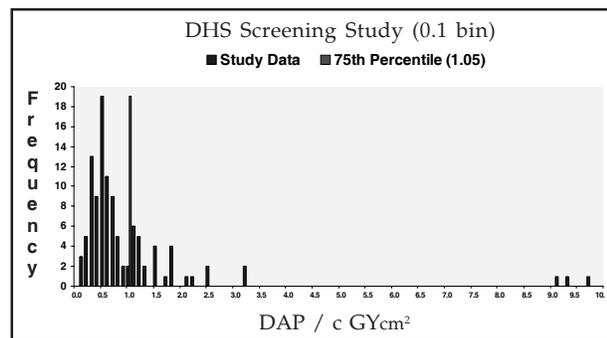


Figure-1

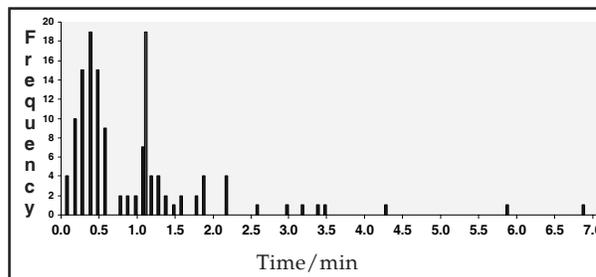


Figure-2

fractures were on the right side and 52 on the left. The breakdown of different grades of surgeons performing the procedures is shown in Fig-3.

The total screening time for the procedure was 78.25 minutes with an average of 0.877 of a minute (i.e.) 52.62 seconds. The total Dose Area Product (DAP) was 96.42cGy/cm<sup>2</sup> with an average of 0.860cGy/cm<sup>2</sup>. The majority of operation were performed by the middle grade surgeons with an average screening time of 38.5 second and a DAP of 0.756cGy/cm<sup>2</sup>. (Fig-4 and Fig-5)

The results were then compared to 100 consecutive IVUs and Barium enemas and 250 consecutive abdominal and chest x-rays performed at our hospital with available DAP data. (Table-I)

### DISCUSSION

A lot of procedures in orthopaedic surgery are performed under the fluoroscopic guidance. The current trend to use minimally invasive procedures in orthopaedics will make use of Fluoroscopy even more common. The orthopaedic literature contains a great deal of data concerning the safety precautions & minimal doses to the surgeons using Fluoroscopy.<sup>1-5</sup>

However, there is little data on optimizing the patient doses.<sup>6</sup> The DAP recommended as DRL in our study did not follow the methods recommended by the DRL review committee,

Table-I

|                               | IVU   | Ba Enema | AXR    | CXR    | DHS    |
|-------------------------------|-------|----------|--------|--------|--------|
| 75 <sup>th</sup> Percentile   | 1811  | 1607     | 381    | 12     | 1.05   |
| Average                       | 1458  | 1497     | 352    | 10     | 0.860  |
| % 75 <sup>th</sup> percentile | 80.5% | 93.15%   | 92.38% | 83.33% | 81.90% |

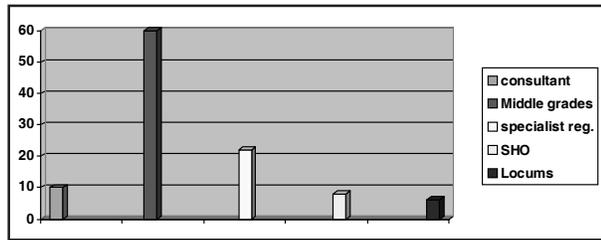


Fig-3: Surgery and Grades of Surgeon

as various factors, like weight and thigh size of patient were not taken into consideration. This was because of the general condition and old age of the patients undergoing such procedures. It was felt that this will add little to the existing data and an DRL was set as a guidance to aim for and not as a limit. The results from our study suggests, that on average the DAP, as well as screening times were well below those recommended.

The DAP for specialist registrars in training at our hospital was above the recommended level and the speculation was that this might be due to the new environment as the SpR's hospital frequently during their rotation. Other reasons may include, striving for perfection, size of patient, experience of radiologist and difficulty of cases.

### CONCLUSIONS

At present there are no DRL for orthopaedic procedure locally or nationally in United Kingdom, despite this being a legal requirement since May 2000. The authors have determined a local DRL for DHS fixation which can be used as a guideline for this procedure. We recommend that DRL be set for other orthopaedic procedures done under Fluoroscopic guidance, especially procedures involving younger patients.

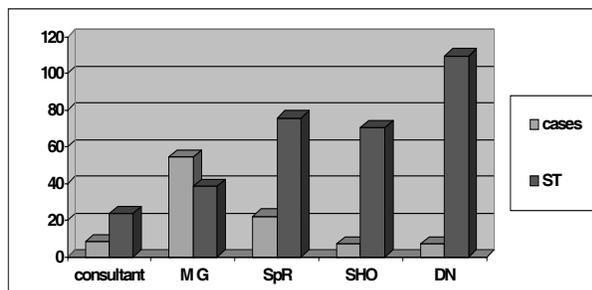


Fig-4: Grade of Surgeon and Screening Times

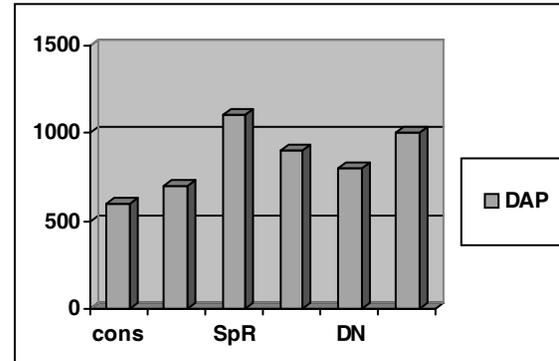


Fig-5: Grade of Surgeon and DAP

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