How we manage radiation protection in our country
British Society of Paediatric Radiology

Paediatric upper gastrointestinal contrast studies

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Are our fluoroscopic radiation doses within national limits, and are these limits still appropriate?

An audit of practice in a large four-Hospital Site UK Trust.

Aims

1. To audit our adherence to the current UK diagnostic reference levels (DRLs) for paediatric upper gastrointestinal fluoroscopic studies.
2. To investigate the indications of the referrals made.

Materials/Methods

1. Data collection from PACS, RIS and patient records on dose, indications and findings in paediatric barium swallows performed at Pennine Acute Hospitals NHS Trust, and performed mainly by a consultant paediatric radiologist. Age range 0-18 years (World Health Organisation definition of a child). Over a period of 3.5 years, from February 2009 to November 2012, just over 250 examinations were performed. We examined the data from the 72 most recent examinations. Data was securely collected and analysed on Trust PCs.
2. Compare the dose data to the National Recommended Dose levels in the UK (NRDs) and also to those published by Great Ormond Street Hospital.

Results

Analysis of the 72 most recent cases of contrast swallow examinations revealed: 48 examinations were performed at North Manchester General Hospital, 12 at Royal Oldham Hospital, 10 at Fairfield General Hospital, and two at Rochdale Infirmary. The gender split was 38 male and 34 female. The youngest patient was one month old and the oldest was 18 years old. Thirty-nine patients (54%) were under two years of age and 33 were above. Forty-four of the 72 barium swallow examinations (61%) were positive for an abnormality, 28 were normal. The highest dose recorded was 73.5 cGycm^2 and the lowest was 1.1 cGycm^2. The average dose was 14.1 cGycm^2. The indications for referral were as follows: vomiting 31, reflux 15, dysphagia 13, and others 22.

All studies were performed under the NRDs published by the Health Protection Agency. This means that 100% of the target was met.

We also compared our data to the DRLs of Great Ormond Street Hospital, for DAP ranges and DAP mean.

DOSE vs Age	NRDs (cGY cm2)	PENNINE DAP Range (cGY cm2)	GOSH DAP Range (*) (cGY cm2)	Pennine DAP Mean (cGY cm2)	GOSH DAP Mean (*) (cGY cm2)
0-1 yrs	150	2 - 70	0.3 - 39.2	11	12.4
1-7 yrs	150 – 270	1.1 - 59.6	0.1 - 80.6	12.7	13
8+ yrs	270 – 460	6 - 73.5	1.3 - 76.8	21.0	18.9

Table 1: Our dose recordings compared to the NRDs and GOSH data (Ref. 1).

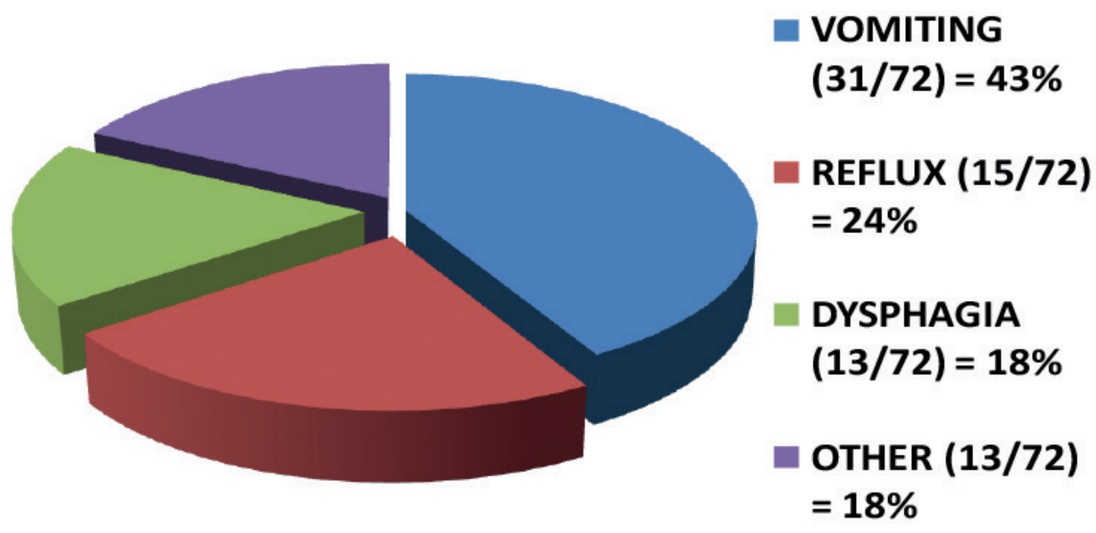

Chart showing indications of referrals.

Discussion

In the United Kingdom, the Health Protection Agency (HPA) has an overall monitoring capacity to oversee the doses used in various radiological investigations. They set standard diagnostic reference levels (DRLs) and National Recommended Doses (NRDS). In 2000, following an analysis of the paediatric fluoroscopy dose data submitted by many UK hospitals, the HPA published recommended acceptable maximal dose reference levels generic for all paediatric fluoroscopy examinations. These were divided into three age ranges to reflect the variation in paediatric patients.
Several institutions have argued that these NRDs are actually too high, and that the dose limits should be lower.

In 2006, Hiorns et al., from the renowned Great Ormond Street Hospital, illustrated this by publishing their own paediatric fluoroscopic dose data and compared them to national standards. They illustrated that by using good technique and modern equipment much lower doses were consistently achievable. They studied the doses for several fluoroscopic examinations, including barium swallows. Their data has been compared with our findings in the results section.

We believe that the current NRDs should be reduced to reflect improvements in practice and the use of newer equipment that can achieve significantly lower doses.

Ideally, the examinations should be appropriately selected and performed by appropriately trained radiologists with a paediatric interest.

Dose reduction techniques that we regularly practice during each examination performed include:

1. Use of appropriate collimation to reduce the body area exposed to radiation.
2. Use of short fluoroscopy time (pulsed), only screening when required, and screen capture necessary images if they are of adequate quality rather than performing a formal exposure.
3. Use of the 'as low as reasonably achievable'(ALARA) principle.

Conclusion

Our audit highlights that in our non-tertiary centre, paediatric upper gastrointestinal fluoroscopic doses are within the national dose reference limits.

However, the current paediatric UK dose reference limits were set over 12 years ago. We believe that these levels should be reviewed and set much lower to continually promote best practice and keep doses as low as reasonably possible.

These techniques include focused collimation, pulsed fluoroscopy and optimised equipment controlled by appropriately trained and experienced operators/radiologists with an interest in paediatric radiology.

Poster References:

A review of current local dose–area product levels for paediatric fluoroscopy in a tertiary referral centre compared with national standards. Why are they so different? M P Hiorns, A Saini and P J Marsden. Br J Radiol April 2006 79:326-330