UK Experience of Paediatric Anaesthesia for Proton Beam Radiotherapy: A Review of the First Year

Nicholas Tabiner [1], Lauren Oswald [2]

[1] Clinical Fellow, Alder Hey Children's Hospital, Liverpool [2] Consultant Anaesthetist, The Christie NHS Foundation Trust, Manchester

Introduction

NHS funded high energy proton beam radiotherapy has been offered to paediatric patients in centres abroad since 2008. In December 2018 the first UK centre commenced service at The Christie Hospital in Manchester.

Individual proton beam treatment fractions are of longer duration than those of conventional radiotherapy, and general anaesthesia or sedation is invariably required in those patients aged younger than four years.[1] Treatment involves daily radiotherapy fractions given over a 4-6 week period.

We carried out a retrospective evaluation of general anaesthesia provided for children undergoing proton beam radiotherapy during the first year of service at The Christie Hospital. Basic qualitative and quantitative data were collected specific to anaesthetic practice.

Methods

Case notes were retrospectively reviewed for all patients completing their course of proton beam radiotherapy under general anaesthesia between January 2019 and January 2020. No patients were excluded.

Data collected included: age and weight at start of treatment; primary target body region; anaesthetic technique; duration of anaesthesia and total time under anaesthesia over the treatment course; anaesthetic related complications; and reasons for cancellation or postponement of treatment.

Ethical approval was not deemed necessary as all data was collected retrospectively after patient's completed their treatment course in full.

Results 1 : Patient Characteristics

A total of 30 paediatric patients completed their treatment course under general anaesthesia within the 12 month period. Patient age range was 18 months to 10 years (median 4 years). Patient weight ranged from 10 to 50 kg (median 18 kg).

Table 1: Number of patients and primary radiotherapy area

Primary Radiotherapy Area	Number of Patients
Brain	15
Head and Neck	5
Pelvis	4
Spine	3
Orbit	2
Brain and Spine	1

Results 2: General Anaesthesia

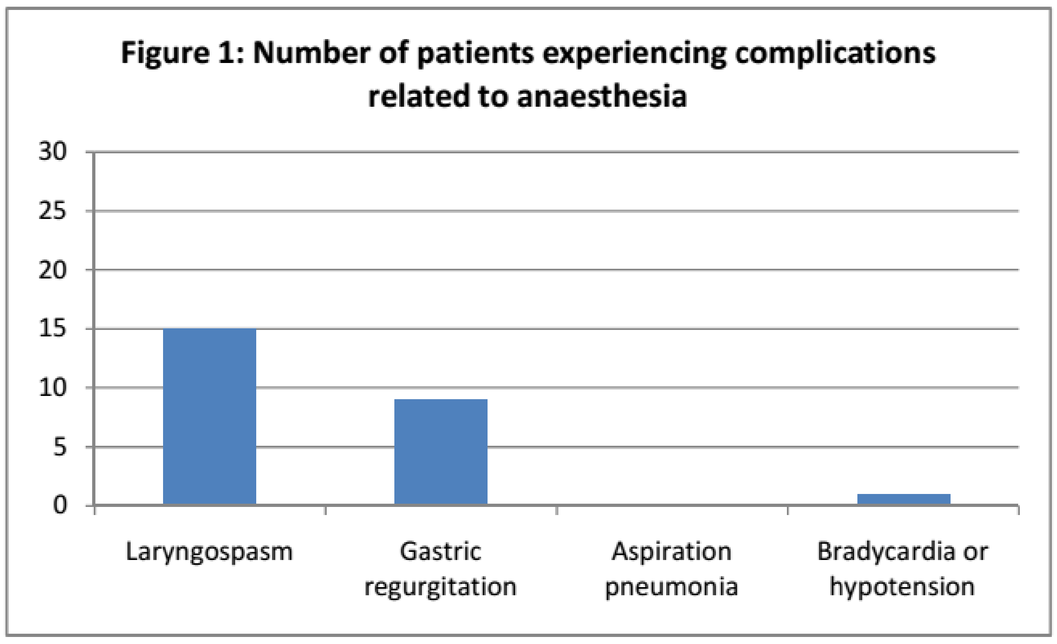
922 general anaesthetics were given: 32 for planning, 890 for treatment. Intravenous induction of anaesthesia with Propofol was used in all except five cases. All cases used Sevoflurane for maintenance of anaesthesia and an airway device (890 LMA, 32 ETT).

Table 2: Anaesthetic episodes and duration of anaesthesia

	Average (median)	Range
Total number of anaesthetics per treatment course	30	23-35
Duration of anaesthesia for individual treatment fractions	67 minutes	50-90 minutes
Duration of anaesthesia for planning scans (CT, MRI)	145 minutes	115-190 minutes
Total cumulative time under anaesthesia over treatment course	36 hours	22-46 hours

Results 3: Complications, Postponements and Cancellations

Laryngospasm was encountered in 62 anaesthetics (15 individual patients) and occurred at induction, in the proton beam gantry and in the recovery area.



One patient had their treatment course terminated early due to airway swelling, and another required emergency transfer and admission to paediatric intensive care for a similar problem.

Discussion

Our results demonstrate how a conventional and replicable anaesthetic technique can be safely applied in a newly established proton beam therapy paediatric anaesthesia service.

Patient demographics and pathologies were comparable to other centres, as were the number of treatment fractions and the duration of anaesthesia.[2] Laryngospasm and airway swelling were the most conspicuous complications noted. Unfortunately in this regard, comparable data is sparse.

Mucositis is a known side-effect of chemoradiotherapy[3] and it is possible that repeated airway instrumentation could exacerbate this. Intravenous Propofol sedation circumvents the need for an airway device and has been shown to be safe.[4,5] Current practice varies between institutions [6] but there has up to the present been no direct comparison between the two techniques.

References

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