

A retrospective analysis of episodes of single tooth extraction under general anaesthesia for adults

B. Hong*¹ and A. Birnie¹

VERIFIABLE CPD PAPER

IN BRIEF

- Highlights that general anaesthesia impacts on patients at a personal level with potentially serious consequences, and impacts on the NHS in terms of the use of limited resources.
- Encourages discussions about what drives this patient demand for general anaesthesia in the UK and how it can be changed.
- Recommends national data collection and guidelines containing specific case selection criteria.

Objectives To investigate the provision of adult dental extraction under general anaesthesia (DGA) at the Royal Cornwall Hospitals NHS Trust (RCHT) – specifically adult single tooth DGA episodes in regards to numbers, demographics, justifications, and appropriateness regarding the use of resources. **Method** Data were collected retrospectively from the patient case notes and electronic records for the complete study cohort. This study included all episodes of adult single tooth DGA in all RCHT sites during 2014, except for mandibular third molar and impacted teeth. Each case was tested against the DGA case selection criteria empirically devised for this study. **Results** In 2014, 106 episodes of adult single tooth DGA were carried out in RCHT that met the inclusion criteria. Younger females from more socio-economically deprived areas of Cornwall were increasingly likely to have this procedure. Mental disorders were the most prevalent co-morbidity (21.7%) in this cohort. The vast majority of patients (93.4%) had previously tolerated dental treatment without the need for general anaesthesia (GA). Many referrals (46.2%) and listings (30.2%) specifically stated patient demand-driven reasons. None of the cohort had DGA due to failure of sedation. There were potentially 11 episodes that met the DGA case selection criteria. Patients waited for 126 days (median) from the referral date for an operation which took seven minutes (median) to complete. The majority (83%) of the cases were simple exodontia. Twenty patients (18.9%) had previous DGA. **Conclusion** Potentially a considerable proportion of GA prescription appeared to be driven by patient demand rather than clinical need. This study poses a fundamental question – what drives the demand for DGA? National data collection and specific DGA case selection criteria are recommended.

INTRODUCTION

Many adults in the United Kingdom ‘choose’ to have dental extractions under general anaesthesia (DGA) to manage their dental anxiety, on a healthcare system funded by taxation. This culture affects many parts of the country to varying degrees, but no national data have been collated to date.

The decision to prescribe DGA has to be given careful consideration due to the risk of anaesthetic-related morbidities and the small, but real, risk of mortality. Not to be forgotten are the implications of unnecessary DGA on NHS resources related to staffing, theatre utilisation, ward space, and administration. Typically, a minimum of seven healthcare professionals are involved in a DGA episode – a surgeon, an anaesthetist, an operating department practitioner, two nurses in theatre, and two recovery nurses. The cost

of an episode of DGA varies between cases depending on factors such as the complexity and duration of the operation and the grade and salary of the anaesthetist and surgeon. Jameson *et al.*¹ found that hospital-based DGA is considerably more expensive than advanced conscious sedation techniques in the primary care setting. While patients are increasingly viewed as consumers who exercise choices,² resources provided by taxpayers need to be carefully utilised according to clinical need.

The DGA case selection process can be complex because the clinicians’ duty to act to benefit patients sometimes conflicts with the principle of respect for patient autonomy, particularly when patients choose an option that the clinicians feel is less appropriate.³ Fully exploring options with patients is of paramount importance in reaching a treatment plan that both clinicians and patients are happy with. Tyrer⁴ conducted a study of 82 children referred for DGA. He actively encouraged local anaesthesia (LA) only to parents and children in the pre-assessment clinics. A significant proportion (75%) of the children were able to complete their treatment with good patient satisfaction without the

need for GA. This demonstrated that comprehensive discussion of anaesthetic options and clinicians’ reasoning can influence patients’ anaesthetic choice.⁴

Moreover, DGA case selection is inevitably subjective as clinicians all perceive dental anxiety differently. According to the Adult Dental Health Survey, 28% of the population in England would feel very or extremely anxious about having a dental injection.⁵ This does not, however, mean that everyone in this group requires a general anaesthetic for dental extractions. There are currently no official specific criteria for DGA case selection for adults.

This study was initiated as part of the Royal Cornwall Hospital Oral Surgery department’s ongoing drive to improve patient care. The objective of this retrospective investigation was to analyse adult single tooth DGA episodes at RCHT throughout 2014 in regards to numbers, demographics, justifications, and appropriateness regarding the use of resources. The immediate aim was to add to the literature, a data analysis of patients having single tooth DGA within a hospital trust, in view of the scarcity of literature in this area. Additionally, the study aims to promote data collection on a wider scale, with the

¹Oral and Maxillofacial Surgery Department, Royal Cornwall Hospitals NHS Trust, Truro, UK

*Correspondence to: B. Hong
Email: bosunhong@gmail.com

Refereed Paper

Accepted 1 December 2015

DOI: 10.1038/sj.bdj.2016.24

©British Dental Journal 2016; 220: 21–24

ultimate goal of highlighting and reducing unnecessary DGA procedures.

The decision to investigate only single tooth episodes, excluding mandibular third molar or impacted teeth, was made to minimise the introduction of subjectivity – some clinicians may argue that the use of DGA for multiple extractions is appropriate. It would be impossible, however, for clinicians to agree on the exact number of teeth acceptable for DGA. This approach also allowed a more focused consideration of the subject, highlighting one end of the spectrum of DGA and hopefully leading to further studies.

METHODS

The inclusion criteria were all episodes of adult single tooth DGA from 1 January 2014 to 31 December 2014 in all sites of RCHT, excluding any mandibular third molar or impacted teeth. These cases were identified and investigated retrospectively via case notes and electronic records. The collected data were stored safely in compliance with the Data Protection Act.

A wide variety of data were collected including patient demographics, timescales from referral to procedure, source of referral, reasons for referral/listing, previous dental treatment, and operation details. It was thought that one interesting piece of data would be operation duration – ‘knife to skin’ to ‘end of surgery’ as recorded on the electronic system. Repeat DGA episodes were also recorded from the pre-assessment questionnaire and electronic records. Each case was tested against the DGA case selection criteria empirically devised for this study (Appendix 1). A limitation of this study is its retrospective nature, in that no data related to objective dental anxiety measurement could be collected.

RESULTS

Patient demographics

General

In 2014, 1442 episodes of adult extractions (of any number/type of teeth) took place under GA, 536 under sedation, and 1410 under LA at the RCHT. This means that 42.6% of the total adult extraction cases were under GA. Out of the 1442 DGA episodes, 106 episodes of single tooth DGA were carried out for adults that met the inclusion criteria. The demographics are reported in Table 1. Females were 3.6 times more likely to have single tooth DGA than males. The age of patients ranged from 18 to 76 with the average age of 38.7 years. There was a pattern of decreasing number of patients with increasing age after the peak in the 30–39 years age group. The majority (73.6%) were non-smokers.

Deprivation

The English Index of Multiple Deprivation (IMD) was used to determine the deprivation status of this cohort. Six patients (5.7%) came from areas in Cornwall considered to be within the most deprived 10% in England, and 19 patients (18%) from areas considered within the most deprived 20%. Sixty-eight patients (64.2%) came from the first (most deprived) and second quintile areas.⁶

Forty-five percent of the Cornwall population live in ‘deprived’ areas in terms of geographical barriers to health services.⁶ The one-way distance travelled ranged from 0.3km to 76.9km, and 23.2km on average. Twenty-four patients (22.6%) travelled 32.2km (20 miles) or more.

Co-morbidities

The American Society of Anaesthesiologists (ASA) physical status classification is a subjective assessment of the preoperative physical health of patients.⁷ The ASA classification and co-morbidities of the cohort are shown in Table 2. Mental disorders were the most prevalent (21.7%) co-morbidity in this cohort, depression being the most common condition. This was followed by chronic pain conditions (17%) such as musculoskeletal conditions and cluster

headache. Two out of the eight patients with ASA III met the DGA case selection criteria.

Previous dental treatment experience without GA

The vast majority (93.4%) of patients previously had dental treatment without GA. Ninety-six patients (90.6%) previously had restorative dental treatment without GA as demonstrated in Table 3. Over half of the patients (55.7%) previously had permanent tooth extraction(s) without GA. There were seven patients (mostly under 30 years old) who had never had any restorations or extractions due to healthy dentition.

Patients' journey through the process

Reasons for referral

The referrals of this cohort of patients came from 67 dentists based in 37 primary dental services (out of 84 services available in Cornwall)⁸ All dentists provided reasons for referral as shown in Table 4. Forty-nine referrals (46.2%) stated patient demand-driven reasons. Eighteen cases were referred for GA specifically. Six referrals specified that extraction was attempted before making the referral.

Table 1 Demographics of patients

Characteristic	Frequency	Percent
Gender		
Female	83	78.3
Male	23	21.7
Age group		
18–20	3	2.8
20–29	27	25.6
30–39	30	28.3
40–49	22	20.8
50–59	17	16
60–69	5	4.7
70–79	2	1.9
Smoking status		
Non-smoker	78	73.6
<10 cigarettes per day	9	8.5
10≤ cigarettes per day	19	18
Relative deprivation (English IMD)		
1st quintile (most deprived)	25	23.6
2nd quintile	43	40.6
3rd quintile	34	32.1
4th quintile	4	3.8

Table 2 Co-morbidities

ASA grade	Frequency
I (A healthy patient)	53
II (A patient with mild systemic disease)	45
III (A patient with severe systemic disease that is limiting but not incapacitating)	8
IV (severe systemic disease considered to be a constant threat to life)	0
V (moribund)	0
Condition	Frequency
Mental disorders (including 16 cases of depression)	23
Cardiovascular conditions	17
Musculoskeletal conditions	16
Asthma of varying severity	16
Diabetes Mellitus (including four with poorly controlled type 1 diabetes mellitus)	8
Gastrointestinal conditions	9
Neurological conditions	4
Obesity	6
Hypothyroidism	3
Haematological conditions	2
Urological disease	1
Other, eg rhinitis, Sjögren's	5

Table 3 Previous restorations without GA

Dental treatment	Frequency	Percent
One restoration	10	9.4
Multiple restorations	47	44.3
Root canal treatment	4	3.8
Root canal treatment and multiple restorations	35	33
Total	96	90.6
Restorations under GA due to severe autism	1	0.9
No restoration	7	6.6
No radiograph	2	1.9
Grand total	106	100

Consultation and reasons for listing

This cohort was listed for single tooth DGA by 19 clinicians (including ten locums throughout 2014) at RCHT for the reasons shown in Table 3. The number of listings with documented patient demand-driven reasons was 32. Over half of the listings (56.6%) did not have documented reasons for GA. Seventeen patients were listed for sedation (16) or LA (1) at consultation, but prescribed GA by the operator/anaesthetist. One patient in this cohort had an extraction attempted under LA at RCHT before recourse to GA. None of the cohort had DGA due to failure of sedation.

Judging by the recorded history, there were potentially 11 patients who had single tooth DGA due to reasons that met the DGA case selection criteria that were empirically devised for this study; severe autism (1), autistic and mental issues (1), marked psychiatric issues (1), severe learning difficulties with cerebral palsy (1), bipolar disorder, post-traumatic stress disorder, and panic attacks (1), panic attacks (1), strong gag reflex (2), parkinsonism and requiring surgical extraction (1), failed extraction under LA at RCHT (1), dental phobia (1) (patient had two restorations without LA due to needle-phobia).

Sixteen patients were deemed phobic either by the referrer (12) or at RCHT (6). Of these, two were agreed to be needle-phobic by both the referrer and consulting clinician, but they all previously had multiple restorations without GA. Out of the 16 reported phobic patients, 13 previously had restorations, and eight had extractions without GA.

Waiting time

The waiting time from the date of referral to the operation date ranged from 12 days to 324 days with the mean and median being 136 and 126 days, respectively. During this period, three patients visited casualty due to pain and received symptomatic treatment such as oral antibiotics and analgesics.

Table 4 Documented reasons for referral and listing

Reason for Referral	Reason for listing for GA
49 cases – patient requests/prefers: sedation (10), GA (15), sedation/GA (26). Due to phobia (4), anxiety (4), declined LA (6), declined private sedation (1), failed attempt (1) unspecified (33).	32 cases – patient requests/prefers GA Due to phobia (2), anxiety (4), declined sedation (4), bad experience (2), unspecified (15), other (5) e.g. patient does not like needles.
27 cases – patient requires: sedation (16), GA (3), sedation/GA (8). Due to phobia (4), potential surgical removal (2), anxiety (1), autism (1), failed attempt (3), unspecified (16).	14 cases – patient requires GA Due to phobia (4), anxiety (6), gag reflex (2), Parkinson's (1), autism (1)
30 cases – unspecified modality in referral Due to phobia (4), anxiety (6), potential surgical removal (6), failed attempt (2), panic attack (1), learning difficulty (1), autism (1), other eg, please extract (9).	60 cases – no documentation for listing for GA.

Operation

The cohort was operated by 17 surgeons (including nine locums throughout 2014). In terms of continuity of care, six patients were operated by the same clinician that they met at the consultation appointment. The most commonly singly-extracted tooth in this cohort was lower six (29 out of 106), followed by upper eight (20 out of 106). For the purpose of this study, a surgical extraction was defined as one that involves raising a flap. The majority (83%) of the cases were simple exodontia. The operation duration ranged from one minute to 43 minutes. There was one case that lasted the whole session (43 minutes). The mean and median operation duration was 9.4 minutes and 7 minutes, respectively. Forty-one (38.7%) cases took five minutes or less. Six of the eight cases referred for potential surgical extraction were simple exodontia, taking 4.6 minutes on average.

Post-operative complications in recovery

There were five episodes of relatively minor complications; nausea and vomiting (2), shivering in recovery (1), chest pain relieved by salbutamol (1), and oxygen desaturation to 93% (1).

Repeat GA

Twenty patients (18.9%) had previous DGA episode(s). Of these, nine patients had previous single tooth DGA. Three patients previously had two or more episodes of DGA. One patient had five episodes of DGA in the past seven years, having previously had root canal treatment and extractions without GA.

DISCUSSION

To the author's knowledge, this is the first study to comprehensively investigate adult DGA service at trust level, following patients' journey through the whole process. The principle finding of this study was that a considerable number of DGA episodes were seemingly patient demand-driven, indicating a potentially inappropriate use of resources.

Number of DGA episodes

It should be noted that this study examined only a small proportion of the total adult DGA episodes as only single tooth DGA episodes were investigated. A considerable proportion (42.6%) of the overall adult extraction cases in this trust were prescribed GA in 2014. It is difficult to know how these figures compare to other trusts. The Hospital Episode Statistics (HES) database does not have an accurate record of the number of DGA cases at national level. This is because the anaesthetic type for the dental procedure is not recorded on HES data and not all hospital day-case episodes are transferred to HES.

Sammur *et al.*⁹ found that significantly more GAs were prescribed for mandibular third molar extractions at a district general hospital than in a dental hospital. The publication 'Securing Excellence in Commissioning NHS Dental Services'¹⁰ stated that approximately 80% of referrals to an oral and maxillofacial surgery unit are for oral surgery and about 20% specifically require the services of a maxillofacial surgeon. These figures emphasise the importance of encouraging a culture of careful consideration in regards to anaesthetic choice for dentoalveolar procedures.

Patient demographics

The results of this study revealed that younger females were more likely to have single tooth DGA than others. Possible reasons are higher dental anxiety in females than males,¹¹ and reducing levels of dental anxiety with increasing age.⁵ In this study, however, dental anxiety was not objectively measured.

There was a higher number of patients from more deprived areas in this cohort. Sammur *et al.*⁹ used the Scottish IMD and also showed that patients from more deprived areas were increasingly likely to have a GA than those from more affluent areas.

This study highlighted the practical inconvenience for patients that can result from unnecessary referral to secondary care due to anaesthetic choice. Many travelled a long

way from rural areas of Cornwall twice (consultation and operation), and some people had co-morbidities that impaired mobility.

Depression was the most prevalent co-morbidity in this cohort (15%, all females), which was slightly lower than the UK prevalence (19%), but confirmed the finding that depression more commonly affects women than men.¹² Anttila *et al.*¹³ found that self-perceived dental treatment need was more commonly found among more depressed patients, and that depressed patients considered preservation of the natural dentition to be less important. In addition, Pohjola *et al.*¹¹ stated that depressed patients were more likely to have high dental anxiety than those without such disorders.

Justification for DGA

Arguably only 11 patients were deemed to have had a single tooth DGA for appropriate reasons – those meeting the DGA case selection criteria devised for this study. The retrospective nature of this study needs to be considered when interpreting these results.

The referrals came from a large proportion (44.1%) of the dental services in Cornwall. Many did not specify why GA was required and it was difficult to tell whether the words 'request' and 'require' were used interchangeably. The proportion of patient demand-driven referrals and listings recorded may be underestimations as more than half of the listings did not have documented justification for GA.

It was questionable whether some patients had a genuine dental phobia or a profound enough dental anxiety to meet the criteria. Although previous dental treatment without GA is not an established gauge for dental anxiety, someone who has undergone root canal treatment and multiple restorations without GA is unlikely to have a genuine needle-phobia. However, due to the fact that objective dental anxiety measurements were not part of the data collected, limited conclusions can be drawn.

The results suggested that alternative anaesthetic techniques may have been under-explored in this cohort. Few of the patients had actually tried other anaesthetic modalities before recourse to DGA. An interesting

finding was that no one was listed for GA due to failure of treatment under sedation.

Some patients were not treated by the anaesthetic modality originally suggested by referrers or prescribed at consultation. This may be due to patients' change of mind, increasing anxiety on the day of surgery, or the operator and/or anaesthetist perceiving the patient's anxiety levels differently to the consulting clinician.

Use of resources

A large number of patients 'requesting' DGA for simple procedures inevitably delays the operation for those who genuinely 'require' DGA. Patients also carry avoidable risks such as spreading infection and analgesic overdose while on the waiting list for GA. Emergency admissions may be potentially serious and certainly increase the use of NHS resources.

The relatively short duration and simplicity of the operations in this cohort were notable, implying that many cases listed for GA were hard to justify from a surgical perspective. This, again, has a negative impact on the use of NHS resources when consideration is given to staff salaries, theatre time, and administration.

Some patients in the cohort had previous experience of DGA, confirming the potential for repetition of the aforementioned inefficiencies. GA does not improve dental anxiety in the long term.¹⁴ In fact, one patient in this cohort cited their reason for requesting GA as an uneventful previous DGA, highlighting the importance of patient education regarding the appropriate reasons for GA.

The need for DGA case selection criteria

The General Dental Council¹⁵ broadly stated that DGA should only be considered if there is 'overriding' clinical need, and the Department of Health¹⁶ stated that all other alternative ways to manage anxiety should be excluded before recourse to GA. Specific guidelines containing DGA case selection criteria would allow clinicians to inform patients of the specific indications for DGA, and help direct the provision of DGA more appropriately.

CONCLUSION

The data presented here originate from only one hospital trust and, as such, limited conclusions can be drawn. National data collection is recommended.

This study indicates that a notable percentage of patients in the study cohort potentially had DGA driven by their demand rather than clinical need, which led to inefficient use of resources and arguably inappropriate anaesthetic choice. These findings, in turn, pose a fundamental question – what drives this patient demand for DGA?

Well-defined guidelines with specific DGA case selection criteria would be a step forward in instituting and encouraging a more sensible culture in which anxious patients undergo simple dentoalveolar surgery in a safer, more efficient, and cost-effective way.

Acknowledgement

We are grateful to Andrew Baker (maxillofacial surgeon) and the oral and maxillofacial surgery team at the Royal Cornwall Hospital for their support in this study.

1. Jameson K, Averley P A, Shackley P, Steele J. A comparison of the 'cost per child treated' at a primary care-based sedation referral service, compared to a general anaesthetic in hospital. *Br Dent J* 2007; **203**: E13.
2. Khalique N. Informed consent: the dawning of a new era. *Br J Oral Maxillofac Surg* 2015; **53**: 479–484.
3. Beauchamp T L, Childress J F. *Principles of biomedical ethics*. 5th ed. New York: Oxford University Press, 2001.
4. Tyrer G L. Referrals for dental general anaesthetics – how many really need GA? *Br Dent J* 1999; **187**: 440–443.
5. Hill K B, Chadwick B, Freeman R, O'Sullivan I, Murray J J. Adult Dental Health Survey 2009: relationships between dental attendance patterns, oral health behaviour and the current barriers to dental care. *Br Dent J* 2013; **214**: 25–32.
6. Messenger A. Index of multiple deprivation 2010: Briefing note. Cornwall Council. 2011.
7. Daabiss M. American Society of Anaesthesiologists physical status classification. *Indian J Anaesth* 2011; **55**: 111–115.
8. Care Quality Commission. Dental service provider search. Online search words 'Cornwall, Newquay, Truro, Penzance, Helston' at <http://www.cqc.org.uk/search/services/dentists> (accessed May 2015).
9. Sammut S, Lopes V, Morrison A, Malden N J. Predicting the choice of anaesthesia for third molar surgery – guideline or the easy-line? *Br Dent J* 2013; **214**: E9.
10. Illingworth S. *Securing excellence in commissioning NHS dental services*. NHS Commissioning Board 2013. Online information available at <https://www.england.nhs.uk/wp-content/uploads/2013/02/commissioning-dental.pdf> (accessed November 2015).
11. Pohjola V, Mattila A K, Joukamaa M, Lahti S. Anxiety and depressive disorders and dental fear among adults in Finland. *Eur J Oral Sci* 2011; **119**: 55–60.
12. Beaumont J, Lofts H. *Measuring national well-being – health*. Office for National Statistics, 2013.
13. Anttila S, Knuutila M, Ylostalo P, Joukamaa M. Symptoms of depression and anxiety in relation to dental health behaviour and self-perceived dental treatment need. *Eur J Oral Sci* 2006; **114**: 109–114.
14. Davies C, Harrison M, Roberts G. *UK national clinical guidelines in paediatric dentistry: guideline for the use of general anaesthesia (DGA) in paediatric dentistry*. London: Royal College of Surgeons of England, 2008.
15. General Dental Council. *Maintaining standards guidance to dentists on professional and personal conduct*. London: GDC, 1997.
16. Department of Health. *A conscious decision: a review of the use of general anaesthesia and conscious sedation in primary dental care*. London: Department of Health, 2000.

Appendix 1 DGA extraction case selection criteria

- Physical, emotional, learning impairment
- Medical problems which are better controlled with the use of GA
- Severe trismus and cases that require incision and drainage
- Complex operative procedure, eg surgical removal of deeply impacted teeth
- Procedure expected to take 40 minutes (single slot) or longer
- Failure of extraction using other modalities at RCHT
- Allergy or any contraindication to LA