A decade of change in the uptake of parathyroidectomy in England and Wales

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ABSTRACT

INTRODUCTION Since the late 1990s, a number of factors have reduced the threshold for parathyroidectomy in patients with primary hyperparathyroidism. This study examined whether this has translated into increased numbers of parathyroid operations over the last decade.

METHODS A retrospective analysis was performed of the Patient Episode Database for Wales and English Hospital Episode Statistics annual data from 2000 to 2010 for parathyroidectomy admissions per 100,000 population. Statistical analysis was by linear regression.

RESULTS Between 2000 and 2010 there were 24,247 parathyroid operations in England and Wales (0.005% of the population), with 3 times as many women treated as men. Overall, incidence of parathyroidectomy rose from 3.3/100,000 population in 2000 to 5.8/100,000 in 2010 ($p<0.0001$). In England, it increased from 3.3/100,000 population to 5.8/100,000 and in Wales, it increased from 2.4/100,000 population to 4.6/100,000. Despite similar population demographics, the difference in the rate of change between England and Wales was significant ($p<0.05$). Uptake also varied according to age; in those aged 0–14 years, incidence of parathyroidectomy remained static whereas in all other age groups, uptake of parathyroidectomy increased significantly from 2000 to 2010. Most notably, surgical intervention in those aged 60–74 and >75 years nearly doubled over the decade ($p<0.0001$).

CONCLUSIONS The incidence of parathyroidectomy in adults has increased significantly in the last decade in England and Wales. This likely reflects changes in population demography, available guidelines, lower threshold for referral, changing surgical approach and the realisation that surgical morbidity is now infrequent.

KEYWORDS

Hyperparathyroidism – Parathyroidectomy – Incidence

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Historically, parathyroidectomy was reserved for patients with symptoms or metabolic sequelae of primary hyperparathyroidism (pHPT). However, in the last two decades, a number of factors have affected the spectrum of disease and the demographic of those considered for surgical treatment.

First, the management of a significant proportion of patients with either minimal hypercalcaemia or minimally symptomatic pHPT (in some cases labelled as ‘asymptomatic’) has been informed by a combination of expert opinion and clinical guidelines. The 1990 National Institutes of Health (NIH) guidelines first examined the uncertainty around asymptomatic pHPT,¹ and two further NIH workshops on this subject in 2002² and 2008⁵ have resulted in the development of specific criteria for parathyroidectomy in those with asymptomatic disease (Table 1).

Second, the incidence of pHPT increases with age, affecting up to 2% of the elderly population.^{4,5} The UK

population has aged significantly during the last two decades and the proportion of older people is predicted to increase further during the next two decades, with those aged 65 years and above projected to account for 23% of the population by 2035.⁶ Furthermore, given that Office for National Statistics data predict, depending on sex, that a 65 year old may expect to live until the age of 83–86 and that an 85 year old may live until the age of 91–92, an elderly person may experience symptoms for many years if left untreated.^{7,8} It is therefore likely that increasing numbers of elderly patients will require surgery.

Third, advances in technology with preoperative localisation and intraoperative parathyroid hormone measurement have permitted the development of focused or minimally invasive procedures with the aim of reducing the extent and complications of surgery.⁹ Such operations can also be performed under local anaesthesia,¹⁰ allowing

Table 1 Comparison of new and old guidelines for parathyroid surgery in asymptomatic primary hyperparathyroidism* (adapted from Bilezikian *et al*)³

Measurement	1990	2002	2008
Serum calcium (> upper limit of normal)	1–1.6mg/dl (0.25–0.4mmol/l)	1.0mg/dl (0.25mmol/l)	1.0mg/dl (0.25mmol/l)
24h urinary calcium excretion	>400mg (>10mmol)	>400mg (>10mmol)	Not indicated ^a
Creatinine clearance (calculated)	Reduced by 30%	Reduced by 30%	Reduced to <60ml/min
Bone mineral density	Z-score <–2.0 in forearm	T-score <–2.5 at any site ^b	T-score <–2.5 at any site ^b and/or previous fracture fragility ^c
Age	<50 years	<50 years	<50 years

*Surgery is also indicated in patients for whom medical surveillance is neither desired nor possible.

^aSome physicians still regard 24-hour urinary calcium excretion of >400mg as an indication for surgery.

^bLumbar spine, hip, femoral neck or radius: This recommendation is made recognising that other skeletal features may contribute to fracture risk in primary hyperparathyroidism (pHPT) and that the validity of this cut-point for any site *vis-à-vis* fracture risk prediction has not been established in pHPT.

^cConsistent with the position established by the International Society for Clinical Densitometry, the use of Z-scores instead of T-scores is recommended in evaluating bone mineral density in premenopausal women and men younger than 50 years.

enhanced patient recovery even in those with significant co-morbidities. There is also evidence that minimally invasive parathyroidectomy for pHPT can be performed as safely in elderly patients as in the general population.^{7,11} The adoption of focused surgery appears to have changed the perception of risk related to surgery and it has subsequently been shown to have lowered the threshold for surgical referral among some endocrinologists.^{12,13}

Given the changing indications for and surgical approach to parathyroidectomy, together with the increasing numbers of patients being considered for surgery, the aim of this study was to investigate whether this combination of factors has translated into a change in the rate of parathyroidectomy operations performed per head of population in England and Wales over the last ten years.

Methods

A retrospective analysis of the Patient Episode Database for Wales (PEDW) and the English Hospital Episode Statistics (HES) annual data was conducted over a ten-year period, from the year 2000 to 2010. The numbers of patients who underwent parathyroidectomy as a first-time procedure per 100,000 population (Office of Population Censuses and Surveys [OPCS] codes B14.1–B14.9) each year were examined. The rates of parathyroidectomy in four different age groups (0–15, 16–59, 60–74 and ≥75 years) for both England and Wales were also analysed. Statistical analysis for change over time was examined using a linear regression model (Excel®; Microsoft, Redmond, WA, US). A *p*-value of <0.05 was accepted as statistically significant.

Results

Between 2000 and 2010, 24,247 patients underwent parathyroidectomy in England and Wales, representing 0.005% of the population. Three times as many women were

treated as men (Fig 1) and patients most commonly underwent surgery aged 60–74 years (Table 2).

Overall in England and Wales, the incidence of parathyroidectomy increased significantly from 3.3/100,000 population in 2000 to 5.8/100,000 in 2010 (*p*<0.0001). Although the difference in the rate of change in England (3.3/100,000 population to 5.8/100,000) and Wales (2.4/100,000 of population to 4.6/100,000) was significant (*p*<0.05), variation was significantly greater in Wales. (Data not shown.) However, the two cohorts did not exhibit any other significant demographic differences.

The incidence of parathyroidectomy in the four age bands collated by HES and PEDW exhibited significant variation (Table 2). In patients aged 0–14 years, there was no change over time, and the incidence remained between 0 and 0.1 operations/100,000 population over the study period (*p*=0.9). In all other age groups (15–59, 60–74 and ≥75 years), there was a significant increase in the rate of parathyroidectomy between 2000 and 2010; the incidence

Figure 1 Male-to-female ratio of uptake of parathyroid surgery in England and Wales from 2000 to 2010

Table 2 Adjusted volume (per 100,000 population) of parathyroid operations performed in England and Wales combined from 2000 to 2010 categorised by age group (in years)

Age	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
0–14	0.0303	0.0407	0.0307	0.1032	0.0208	0.0522	0.0630	0.0526	0.0524	0.0313	0.0518
15–59	2.64	2.86	3.03	3.44	3.79	3.52	3.54	3.65	3.92	3.89	4.02
60–74	9.16	10.1	11.3	12.7	13.6	13.3	13.3	14.0	16.2	16.5	16.4
≥75	6.33	6.99	7.97	8.36	8.78	7.91	8.40	9.24	10.6	11.1	11.6

of parathyroidectomy increased in 15–59 year olds from 2.6 to 4.0/100,000 population ($p<0.001$), in 60–74 year olds from 9.2 to 16.4/100,000 ($p<0.0001$) and in those aged ≥ 75 years from 6.3 to 11.6/100,000 ($p<0.0001$). The changes in incidence over time are shown in Figures 2–5.

Discussion

These data demonstrate that there has been a significant and progressive increase in the incidence of parathyroidectomy in adult patients from 2000 to 2010. The greatest increase was observed in those aged ≥ 60 years. However, according to the largest prospective dataset on endocrine surgery (British Association of Endocrine and Thyroid Surgeons [BAETS] national audit), mortality following parathyroid surgery remains low at 0.2% and is not associated with age.¹⁴

Although this study does not address the underlying reasons for this increase in parathyroidectomies directly, it is likely that it has occurred as a result of several factors. These include increased diagnosis of those with pHPT (including those with asymptomatic pHPT),¹⁵ an increasingly elderly population, the emergence of focused surgery and local anaesthetic surgery, a reduced threshold for surgical referral and improving perioperative care.

There have been previous doubts raised as to the validity of HES and PEDW data, which are entered frequently by non-medically trained staff. However, it has been demonstrated in systematic reviews that there is a good correlation between

reported and actual validated data, with an estimated coding accuracy of 88–92%.^{16,17}

In order to help minimise the potential for error in this study, all OPCS codes relating to parathyroidectomy were grouped for analysis. However, two factors are likely to have affected our analysis. First, data on parathyroidectomy in Wales were skewed by the small population (approximately a twentieth of the size of England). Consequently, the trends reflected in the data are overwhelmingly representative of activity in England. Second, the data refer to all parathyroidectomy operations, and this would include surgery for pHPT and hyperparathyroidism secondary to renal failure. Examination of the fourth BAETS national audit demonstrates that just fewer than 90% of parathyroidectomy procedures are for pHPT and so it is likely that most of the operations reported in this study were performed in patients with pHPT.¹⁴

These data mirror a pattern noted in other surgical specialties whereby changes in clinical practice, technology and population demography have driven changes in surgical practice. For example, increased adoption of laparoscopic appendicectomy was found in one study to increase the rate of diagnostic laparoscopy for right iliac fossa pain, and was associated with an increase in negative appendicectomy and operative interventions in female patients.¹⁸ Similarly, the adoption of laparoscopic adrenalectomy has permitted the widespread adoption of adrenal metastasectomy for those with isolated secondary deposits of renal cell, colorectal and

Figure 2 Total number of parathyroidectomies in England and Wales **Figure 3** Number of parathyroidectomies in England and Wales in patients aged 15–59 years

bronchial carcinomas¹⁹ whereas, previously, such patients may not have been offered surgery.

Conclusions

These data confirm that there has been a significant increase in parathyroidectomy in adult patients between 2000 and 2010. The reasons for this are likely to be multi-factorial, and include changes in demography, diagnosis and surgical technique. The long-term trend and effects of

this increasing intervention remains to be seen, and more research is required into the risks and benefits of parathyroidectomy in early and asymptomatic disease.

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