Symptomatic sialoadenitis and sialolithiasis in the English population, an estimate of the cost of hospital treatment

M. P. Escudier,[1] and M. McGurk,[2]

Objective To establish the annual incidence, and cost of treating, symptomatic salivary stones and sialoadenitis.
Materials and methods Data relating to sialolithiasis and sialoadenitis were obtained from the Department of Health with respect to the 15 health regions in England during the period 1991–1995. These were analysed to obtain the mean incidence per annum. The proportions of each condition treated on an in-patient and out-patient basis were also calculated. A survey of hospital fees was undertaken to determine the national cost for treating these two conditions.
Results In the period the mean incidence of hospital admission for symptomatic sialoadenitis and sialolithiasis in the 15 health regions in England was 27.5 (19–46) and 31.5 (26–37) per million population per annum respectively. During this time there was a slight shift toward day case treatment.
Conclusions Based on hospital admission data for the period 1991–1995 the mean incidence of symptomatic sialolithiasis is relatively low, being at least 27 per million population per annum and possibly as much as 59 per million population per annum. This represents a cost to the National Health Service of up to £4,000,000 per annum.

Individual experience of managing patients with sialoadenitis or sialolithiasis is normally small. This probably arises from the fact that traditionally these conditions have been managed by four surgical disciplines, the general, maxillofacial, ENT or plastic surgeon, which has diluted individual experience. Furthermore, in recent years interventional radiologists have begun to treat salivary calculi.[1] This dispersal can result in a false impression of low incidence of the disease and its demands on medical resources.

Postmortem studies indicate that calculi are present in 1.2% of the population.[2] However, the majority are asymptomatic since microcalculi are formed continuously and the majority are shed spontaneously.[3] A more pertinent measure of the problem is not the global prevalence of calculi but rather the incidence of symptomatic stones requiring treatment.

Unlike other national medical services the UK has a state system that caters for 90% of the population and a small providential medical provision that serves the remainder. Further, the organisation of the state system is such that operative intervention in the primary care setting is negligible. The vast majority of procedures are undertaken in the secondary or tertiary care sector and a national record of treatment in these sectors is available in the form of hospital admission data by individual ICD code. This provides a method of assessing the incidence of symptomatic salivary disease in the English population.

The relevance of this analysis relates to the general desire to move away from invasive surgery and toward minimally invasive procedures. Apart from a reduced morbidity these techniques usually have the added advantage of releasing or reducing demand on in-patient facilities. Minimally invasive methods are now the treatment of choice for urolithiasis with surgical treatment restricted to less than 5% of patients.[4] By adapting these techniques and equipment the technology can be applied to the salivary system and initial steps in this direction have proved promising.[5] The present study was designed to establish the incidence of symptomatic sialoadenitis and sialolithiasis, and to establish if further developments in this field can be driven by financial imperatives.

Methods

Data were obtained from the Department of Health based on ICD 10 codes and the Hospital Episode Statistics (HES) figures with respect to the 15 health regions in England. This corresponds to a population of 48,532,705 in the census of 1993. The data was corrected at source (DHSS grossing factor) for deficiencies in data collection and referred to all finished consultant episodes (FCEs) for in-patient and day-case admissions in state hospitals. An FCE was defined as a period of patient care under one consultant in one health area. The figures may underestimate the total number of hospital admissions. This is because an individual patient may have been admitted more than once during a treatment episode. Similarly, if the patient transferred to another consultant they would be counted twice. While these sources of error could not be quantified they are believed to have little influence on the overall figures. The ICD 10 codes relating to sialoadenitis and sialolithiasis were interrogated for the years 1991–1995 inclusive. Sialoadenitis was included in the analysis since occult calculi are the underlying cause of adenitis in the majority of cases.[6] Post surgical sialoadenitis is now a rare occurrence.

A survey of hospital fees was undertaken to determine the national cost for treating these two conditions. In each health region, three district general hospitals and one teaching hospital, were randomly chosen and the finance manager asked to provide an

[1]*South Thames Research Fellow, Department of Oral and Maxillofacial Surgery,* [2]*Professor of Oral and Maxillofacial Surgery, UMDS, Department of Oral and Maxillofacial Surgery, Floor 23, Guy's Tower, Guy's Hospital, London Bridge, London SE1 9RT*
REFEREED PAPER
Received 28.01.98; accepted 02.03.99
 186: 463–466

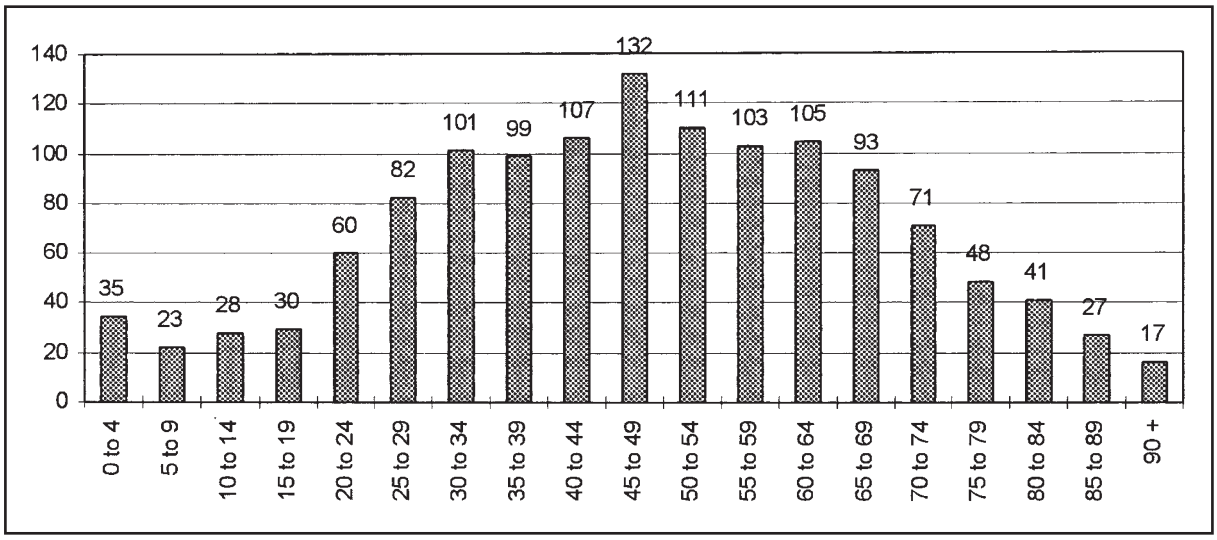

Fig. 1 Average number of cases per annum, by age, of sialoadenitis, based on Department of Health Hospital Episode Statistics for the period 1991–1995. The peak incidence was between 30 and 60 years of age

itemised cost for a day case procedure, daily hospital residence and an intermediate grade operative procedure (sialoadenectomy). In addition, the cost of an out-patient consultation, sialogram and full blood count were requested. The cost of in-patient or day case treatment for England was estimated by assuming each hospital treated a similar number of patients per annum.

Results

Salivary calculi were rare in the age group 0–10 years accounting for less than 1% of the total cases. The peak incidence was between 30 and 60 years of age for sialoadenitis (fig. 1) and between 25 and 50 years of age for sialolithiasis (fig. 2). The mean incidence of hospital admission for symptomatic sialoadenitis and sialolithiasis in the 15 health regions in England, during the period 1991–1995, was 27.5 (19–46) and 31.5 (26-37) per million population per annum respectively. If this was representative of the UK population it represented to the state medical system at least 1,787 and 2,048 hospital admissions respectively per annum.

Hospital statistics showed that the majority of patients with sialolithiasis (70%) and sialoadenitis (93%) were treated as in-patients with a mean hospital stay of 1.9 and 3.5 days respectively. In the period from 1991–1995 there was a slight shift toward day case treatment (22% to 35%) for stones (fig. 3) and (4% to 9%) for sialadenitis (fig. 4). If both conditions were considered together the mean hospital stay (including day cases) was 2.6 days. The male to female ratios were 1 to 1.46 and 1.04 to 1 for sialoadenitis and sialolithiasis respectively. The incidence of each disorder was broadly comparable between areas with the Northern region having a slightly higher, although not statistically significant, incidence for both conditions. A common causal relationship was suggested by the data, as there was a significant correlation in the pattern of incidence between sialadenitis and sialolithiasis (Spearman's correlation coefficient $r_s = 0.78$, $P < 0.01$) when compared by region (fig. 5).

In order to develop an estimate of treatment costs it was assumed that each admission for sialolithiasis consisted of a 1 hour operative

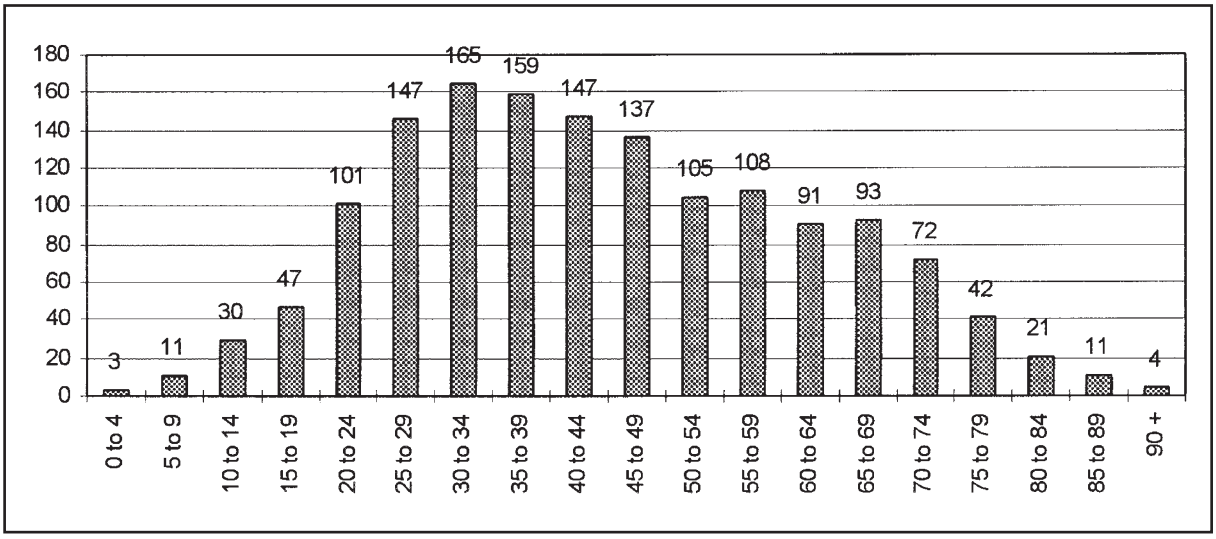

Fig. 2 Average number of cases per annum, by age, of sialolithiasis, based on Department of Health Hospital Episode Statistics for the period 1991–1995. The peak incidence was between 25 and 50 years of age.

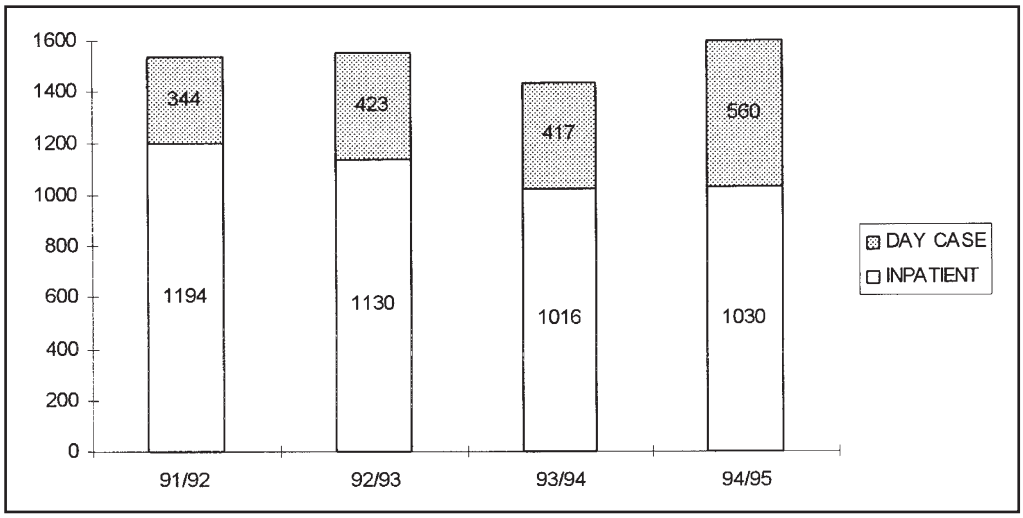

Fig. 3 Relative number of cases of sialolithiasis treated on day case and in-patient basis, based on Department of Health Hospital Episode Statistics for the period 1991–1995.

procedure and 1.9 days bed occupancy and for sialadenitisis 3.5 days admission only. Unfortunately of the four hospitals per region surveyed regarding the cost of treatment only one per region replied. However, as the replies were evenly distributed this was taken as representative. The mean daily hospital cost for England as a whole was £231.50 (£73.56 to £495) and for surgery £515 (£341 to £796). The mean cost of a full blood count was £3.10 (£1.73 to £3.18) and for a sialogram was £68.21 (£30 to £104). The mean cost of an outpatient appointment was £78.10 (£40.51 to £228).

The cost of providing secondary healthcare for salivary calculi was calculated by multiplying average hospital stay by the mean daily admission cost and adding the costs of 1 hour of operating theatre time and an out-patient appointment including investigations. It was assumed that each admission was associated with an operative episode since minor procedures performed under local anaesthesia are usually undertaken on an out-patient basis. The average cost per FCE for this group was £1,107. In the UK this represented an annual cost to the state of £2,266,266.

The cost of treating adenitis was calculated in a similar way except an operative procedure was not included. It would be unusual surgical practice to undertake sialoadenectomy in the presence of acute inflammation and it was assumed that the infection was first controlled by antibiotics. However it is probable that these assumptions seriously underestimate the use of surgery in this group of patients. This arises because if the infection was severe, as suggested by a mean admission period of 3.5 days, then a proportion of cases would have an abscess requiring surgical drainage. Further, if a calculus was the predisposing cause of the infection the patient would ultimately come to elective surgery. These costs were ignored. The mean cost for this group was £960. This represented an annual cost to the UK state medical system of £1,714, 913.

Discussion

Both sialoadenitis and sialolithiasis have been considered in this analysis because an occult calculus is probably the underlying cause of sialoadenitis in the majority of cases.[6] Circumstantial evidence to support this is the suggestion of a common aetiology implied by the close correlation between the two within the population. There is also the rise in incidence with age of sialoadenitis which slightly precedes that for calculi and a similar geographical distribution. Additional supportive evidence is that non-calculi induced adenitis that merits hospital admission, is a relatively uncommon event. The average period of hospital admission for the adenitis group was 3.5 days. This suggests the infection was significant and it is reasonable to assume that a large proportion of this group were suffering from salivary stones. Thus, although official national figures would indicate that the minimum incidence of symptomatic salivary calculi in the UK is 27.5 per million population per annum, if cases of adenitis are included it rises to 59 cases per million population per annum.

The introduction of Trust status to state hospitals has allowed some rudimentary estimate of cost to be obtained. It is conceded

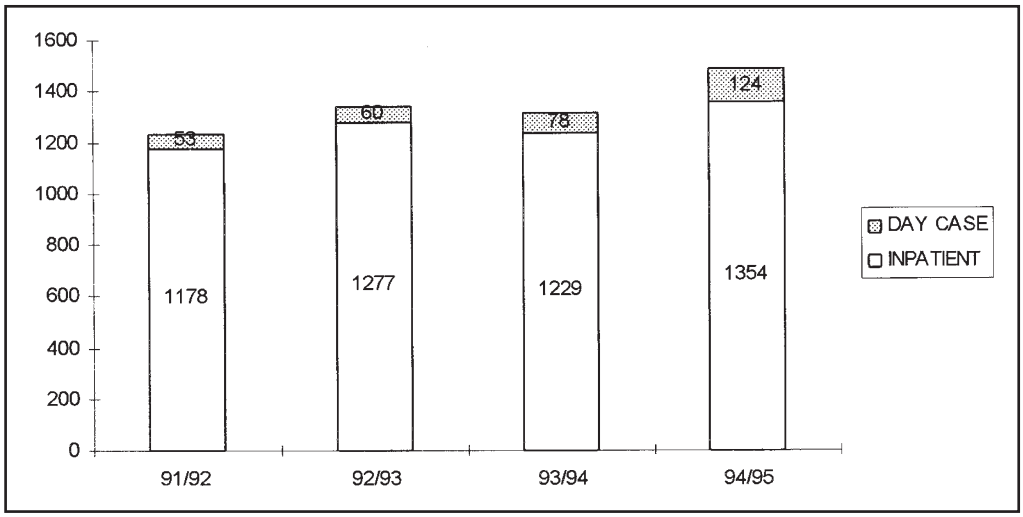

Fig. 4 Relative number of cases of sialoadenitis treated on day case and in-patient basis, based on Department of Health Hospital Episode Statistics for the period 1991–1995.

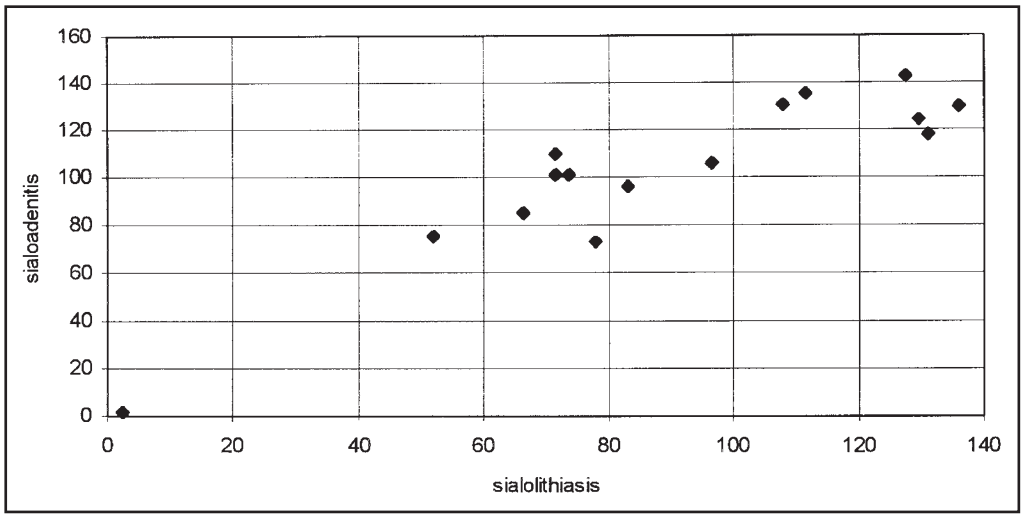

Fig. 5 Average number of cases per year, by region, of sialolithiasis and sialoadenitis, based on Department of Health Hospital Episode Statistics for the 15 regions of England during the period 1991–1995. Spearman's correlation coefficient $r_s = 0.78$, $P < 0.01$.

that costs vary within, as well as between, regions. However, a conservative estimate has been employed to ensure a reasonable appraisal of treatment cost. In fact they are likely to be an underestimate if the adenitis group are considered to have had no surgical intervention. The cost of treating salivary calculi in the UK is estimated at £2,266,266 per annum and for adenitis £1,714,913. If however, sialoadenitis and sialolithiasis are considered the same entity the cost to the UK is estimated to be about £3,981,179 per annum.

The true incidence of symptomatic salivary calculi is likely to exceed the present estimate by 30–50% as the management of salivary calculi is based on the anatomical position of the stone within the salivary duct system. In a review of 1,200 cases of salivary calculi,[2] 83% of stones were located in the submandibular system, with 10% in the parotid and 7% in the sublingual glands. A third of submandibular stones (this included sublingual stones) are located in the distal third of the duct and can be removed under local anaesthesia by a simple intra-oral, out-patient surgical procedure and have not been included in this assessment. This group make little impact on financial cost to the health service and the surgical procedures have a low morbidity. Consequently there is no financial or patient imperative to alter management. This contrasts with current surgical management of the remaining cases where submandibular or parotid sialoadenectomy are the treatment of choice. These surgical procedures carry a risk of neurological damage to the facial nerve (11%–36%),[7] as well as lingual and hypoglossal nerves. Scarring at the incision site and Frey's syndrome confer additional morbidity.

At present new minimally invasive techniques are being pioneered.[8] These offer the real prospect of shifting the treatment of sialolithiasis from the in-patient to out-patient setting with the consequent freeing of hospital resources and reduction in costs. The additional advantage to the patient is that these techniques carry a low morbidity. This study would indicate that there is both a strong financial and clinical argument to support further research into minimally invasive methods of treating salivary calculi.

Conclusion

Minimally invasive techniques as well as having a much lower morbidity are able to provide treatment on an out-patient basis. Based on our own experience and the data presented here there would appear to be compelling evidence to support developments in this field.

1 Buckenham T M, George C D, McIvor D, Moody A R, Coles G S. Digital sialography: imaging and intervention. *Br J Radiol* 1994; **67**: 524-529.
2 Rauch S, Gorlin R J. Diseases of the salivary glands. *In* Gorlin R J, Goldman H M (eds) *Oral pathology.* St. Louis: Moseby, p962, 1970.
3 Epivatianos A, Harrison H, Dimitriou T. Ultrastructural and histochemical observations on microcalculi in chronic submandibular sialoadenitis. *Oral Pathol* 1987; **16**: 514.
4 Chaussy C G, Fuchs G J. Current state and future developments of non-invasive treatment of human urinary stones with extracorporeal shock wave lithotripsy. *J Urol* 1989; **141**: 782-789
5 McGurk M, Escudier M P. Removing salivary gland stones [editorial]. *Br J Hosp Med* 1995; **54**:184-185. discussion 185-186.
6 Epker B N. Obstructive and inflammatory diseases of the major salivary glands. *J Oral Surg* 1972; **33**: 2.
7 Smith W P, Peters W J N, Markus A F. Submandibular gland surgery: an audit of clinical findings, pathology and postoperative morbidity. *Ann R Coll Surg Engl* 1993; **75**: 164-167
8 Escudier M P. The current status and possible future developments for lithotripsy of salivary calculi. *In* Assael L A, Pogrel M A (eds) *Atlas of oral and maxillofacial surgery clinics of North America.* Vol. 6 No. 1. Philadephia: W B Saunders, p117-132, 1998.