

Cost-efficiency of endoscopic and external dacryocystorhinostomy

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Abstract

Background: In most centres in the United Kingdom, endoscopic dacryocystorhinostomy is currently undertaken as a joint operation between ophthalmologists and otolaryngologists. The addition of an extra surgeon, the use of endoscopic equipment and the relatively lower success rate of this procedure made us compare endoscopic dacryocystorhinostomy and external dacryocystorhinostomy with regards to costs and income for our hospital.

Methods: All 38 primary endoscopic dacryocystorhinostomy cases performed in our centre in 2001–2003 were retrospectively compared with the 49 external dacryocystorhinostomy cases performed in 1993–2000. Cost–income calculations were made based on: rate of local anaesthesia, success rate, rate of day case admission, hospital reference cost for dacryocystorhinostomy, and the income per case extracted from national tariffs (based on the Health Resources Group). Also, the average number of cases per session was used to calculate the income gained per session for each method.

Results: The following rates between the endoscopic and the external dacryocystorhinostomy were found: local anaesthesia, 29 vs 6 per cent, respectively; day-case operation, 95 vs 12 per cent, respectively; and success rate, 87 vs 94 per cent, respectively. The average number of endoscopic dacryocystorhinostomy cases conducted in a single theatre session was twice that of external dacryocystorhinostomy cases. Endoscopic dacryocystorhinostomy generated approximately twice the income of external dacryocystorhinostomy (£6585 vs £3292, respectively).

Conclusion: Endoscopic dacryocystorhinostomy is more cost-effective than external dacryocystorhinostomy, despite having a lower success rate and greater usage of resources, as the endoscopic procedure generates more income. This is mainly due to the higher number of cases per session and the higher rates of local anaesthesia and day case operations possible.

Key words: Lacrimal Apparatus Diseases; Endoscopes; Otorhinolaryngologic Surgical Procedures; Cost Benefit Analysis

Introduction

When any new procedure is adopted by a speciality, it is important to assess and audit the new technique's effectiveness, compared with previous treatments used for the same condition. In the current economic environment, it is also important to consider the cost-effectiveness of an intervention, in order to ensure best use of available resources. Indeed, this is part of the remit of the UK National Institute for Clinical Excellence when considering whether to approve new drugs or procedures.

Dacryocystorhinostomy (DCR) is an operation to relieve obstruction in the nasolacrimal system by creating a nasolacrimal fistula proximal to the obstruction. Traditionally, DCR has been performed by ophthalmologists as an external procedure. However, over the past two decades, endonasal

endoscopic DCR has become the surgical treatment of choice for acquired nasolacrimal duct obstruction in many centres. Usually, the endoscopic method is undertaken as a joint operation between ophthalmologists and otolaryngologists. The addition of an extra surgeon, the use of endoscopic equipment and the relatively lower success rate of the endoscopic procedure made us compare these two methods of DCR with regards to their financial costs and income generated for our National Health Service (NHS) hospital trust.

Methods

All primary endoscopic DCR procedures performed in our centre between 2001 and 2003 were retrospectively studied. Patients' age, sex, type of anaesthesia,

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duration of stay (day case or overnight), failure rate and the follow-up period were retrieved from the hospital records (unpublished data). The same data for external DCR procedures performed in our centre between 1993 and 2000 were extracted from a previously published paper.¹ The procedure was performed using 'cold steel' dissection without the use of a light probe or laser, and all patients had been intubated at the end of the procedure.

The trust reference cost for DCR was obtained from the hospital finance department and was used to calculate the cost for each DCR case. The income per case was obtained from the national tariffs based on the Health Resources Group's 'payment by result' system HRG B21 = dacryocystorhinostomy. The average number of cases per session was used to calculate the income gained per session for each method of DCR.

Results

The retrospective data collected for endoscopic DCR over a two-year period are shown in Table I and compared with similar data for external dacryocystorhinostomy, collected in a previous study in our centre.¹ The fees and costs per item are presented in Table II. The cost of each DCR method (endoscopic or external) was calculated as shown in Appendix 1. The costs and income for each method are compared in Table III (financial data were based on figures provided by our NHS finance department in 2006).

Discussion

Our data show that endoscopic DCR was less costly and produced more income compared with external

TABLE III
COST AND INCOME COMPARISON FOR DCR METHODS

Parameter	DCR method	
	Endoscopic	External
Cases per session (average; <i>n</i>)	5	2.5
Cost per case* (£)	1656	1727
Income per case† (£)	1317	1317
Income deficit per case (£)	-339	-410
Income per session (£)	6585.0	3292.5

*See Appendix 1. †Based on National Health Service national tariff (Health Resources Group B21). DCR = dacryocystorhinostomy

DCR. To enable cost comparison, the two methods of DCR were broken down into their component financial elements (for the surgical procedure) in order to calculate the actual cost. The revision rate, type of anaesthesia and the rate of day case surgery have cost implications, and these were taken into account in our calculations. Income calculations were based on the national tariff, which is the same for day case and in-patient DCR. The endoscopic equipment for endonasal surgery was relatively expensive, but the purchase cost was not included in our calculations as the equipment is part of an established otolaryngology theatre. Our study evaluated the procedural costs of the two methods of DCR, but it did not take into consideration any pre- or post-operative costs, as these are entirely the same for both methods in our hospital. Epiphora patients, having been selected by the ophthalmologist, undergo similar pre- and post-operative management regardless of the type of DCR operation. This is achieved in regular joint ENT-ophthalmology clinics.

Endoscopic DCR is more cost-effective as it is performed faster; therefore, more cases can be done in one theatre session. Endoscopic DCR also has the obvious advantages of no skin scar, less bleeding or orbital haemorrhage, intact medial palpebral ligament, intact lacrimal pump mechanism, and intact horizontal apparatus, in comparison with external DCR.² Endoscopic DCR can also address abnormalities that may potentially interfere with creation of the intranasal ostium (e.g. deflected nasal septum or hypertrophy of middle turbinate) via the same approach.³ Endoscopic DCR may also be useful in the management of acute dacryocystitis with abscess formation, when external DCR is a less favourable option.⁴

Despite all the above advantages of endoscopic DCR, it has been considered the inferior procedure owing to its lower success rate. However, this can be challenged.

Firstly, although external DCR has a high success rate of 85–100 per cent, longer follow-up times have given lower figures.²

Secondly, although most earlier studies of endoscopic DCR showed lower success rates compared with external DCR, higher success rates (approaching those of external DCR) have been reported in later studies.^{3,5,6}

TABLE I

COMPARISON OF ENDOSCOPIC AND EXTERNAL DCR

Feature	DCR method	
	Endoscopic	External
Period of data collection	2001–2003	1993–2000
Procedures (<i>n</i>)	38	49
Age (range (mean); years)	31–91 (67.2)	1–82 (50)
Follow up (range (mean); mths)	4–18 (11.3)	3–15 (9)
General anaesthesia (% (<i>n</i>))	71 (27/38)	94 (46/49)
Local anaesthesia (% (<i>n</i>))	29 (11/38)	6 (3/49)
Performed as day case (% (<i>n</i>))	95 (36/38)	12 (6/49)
Performed as in-patient (% (<i>n</i>))	5 (2/38)	88 (43/49)
Failure (% (<i>n</i>))	13 (5/38)	6 (3/49)
Cases per session (average; <i>n</i>)	5	2.5

DCR = dacryocystorhinostomy; mths = months

TABLE II

FEES AND COSTS

Parameter	Value (£)
TRC of day case DCR per case	1422
TRC of in-patient DCR per case	1663
Income of DCR per case*	1317
Surgeon/anaesthetist's fee per session	221

*Based on Health Resources Group B21. TRC = trust reference cost; DCR = dacryocystorhinostomy

Thirdly, endoscopic DCR has been popularised in the past two decades. Over this time, it has been difficult to extract a universal success rate from the literature, owing to diversity in surgical methods; surgical tools (e.g. knife, laser and mechanical drill); type of operation (new case or revision); application of topical mitomycin C; length of follow up; definition of success; and the effect of the learning curve.^{1,3,7,8}

The higher costs of external DCR have been noted in previous studies.⁹ Our data show that endoscopic DCR was a financially better option in comparison with external DCR. This is due to several factors, as follows.

Higher number of cases per session

In our study, twice as many endoscopic DCR cases as external DCR cases could be done in each theatre session. Obviously, this statistic might differ between individual centres. Similar figures have been produced by Hartikainen *et al.*^{10,11} However, Malhotra and colleagues found that equal time was required for both external and endoscopic DCR procedures (approximately 40 minutes).¹²

Higher number of day case operations

A significant difference in the rate of day case surgery was noted in our series. Day case surgery has great implications on surgical costs and income. For DCR, the nationally agreed income is the same for day case and in-patient procedures. However, in-patient DCR is more expensive for the hospital, as we have shown.

Higher number of cases performed under local anaesthesia

One of the factors in the cost reduction associated with endoscopic DCR is the number of cases that can be performed under local anaesthesia. Durvasula *et al.* performed 85 per cent of their endoscopic DCR under local anaesthesia.⁶ However, it must be noted that this will be a cost-saving measure only if all cases within that theatre session are performed under local anaesthetic, in order to avoid allocation of an anaesthetic session fee. Use of local anaesthesia also expands the patient population eligible for the procedure, as it allows older and less fit patients to safely undergo surgery.

Our data also demonstrate that the cost of one DCR is higher than the income generated (Table III). This begs the question of how the trust reference cost is calculated, and whether this could partly explain the current financial shortcomings within NHS trusts. This is an issue that requires more attention, but we did not investigate it further as it was not the objective of our study.

Limitations of the study

Children require general anaesthesia regardless of DCR type. In our study, there were a small number of children in the external DCR group, and this could potentially have skewed the results in favour

of endoscopic DCR. This is a potential bias and needs to be taken into account.

- **In most UK centres, endoscopic dacryocystorhinostomy (DCR) is currently undertaken as a joint operation between ophthalmologists and otolaryngologists**
- **Endoscopic DCR is more cost-effective than external DCR, despite a lower success rate and greater use of resources, as it generates more income in the current UK National Health Service system**
- **The favourable cost-effectiveness of endoscopic procedures is mainly due to a higher number of cases per session and higher rates of local anaesthesia and day case surgery**

The rate of readmission due to complications (e.g. epistaxis) was not calculated in our study. However, the previous study from our centre comparing the two methods showed their respective rates of post-operative epistaxis to be equal (i.e. 4 per cent).¹

Our study compared our current endoscopic DCR data with results from a relatively dated external DCR study. This may have affected outcomes, as some influential factors (i.e. anaesthetic techniques and day case rates) change with time. Currently, there is a campaign to increase the use of day case surgery in UK hospitals; this may improve future rates of day case external DCR surgery.

Conclusion

Endoscopic dacryocystorhinostomy is more cost-effective than external DCR, in spite of the former procedure's requirement for an extra surgeon allocated to the theatre session, and its reported lower success rate (although this can be challenged). Such favourable cost-efficiency is possible because endoscopic DCR produces more income, owing to the higher number of cases per theatre session, higher number of cases performed under local anaesthesia and higher number of cases done as day case surgery.

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Mr S Anari takes responsibility for the integrity of the content of the paper.

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Appendix 1. Cost calculations per single case

Endoscopic dacryocystorhinostomy

$$\begin{aligned}
 &[(\text{Rate of day case} \times \text{day case cost}) \\
 &+ (\text{rate of in-patient} \times \text{in-patient cost}) \\
 &+ (\text{cost of ophthalmologist per case}) \\
 &- (\text{rate of local anaesthesia} \\
 &\times \text{cost of anaesthetist per case})] \\
 &\times (1 + \text{failure rate}) \\
 = &[(0.95 \times \pounds 1422) + (0.05 \times \pounds 1663) + (\pounds 221/5) \\
 &- (0.29 \times \pounds 221/5)] \times 1.13 \\
 = &[1350.9 + 83.15 + 44.2 - 12.81] \times 1.13 \\
 = &\pounds 1655.9 \approx \pounds 1656
 \end{aligned}$$

External dacryocystorhinostomy

$$\begin{aligned}
 &[(\text{Rate of in-patient} \times \text{in-patient cost}) \\
 &+ (\text{rate of day case} \times \text{day case cost}) \\
 &- (\text{rate of local anaesthesia} \\
 &\times \text{cost of anaesthetist per case})] \\
 &\times (1 + \text{failure rate}) \\
 = &[(0.88 \times \pounds 1663) + (0.12 \times \pounds 1422) \\
 &- (0.06 \times \pounds 221/2.5)] \times 1.06 \\
 = &[1463.44 + 170.64 - 5.3] \times 1.06 \\
 = &\pounds 1726.5 \approx \pounds 1727
 \end{aligned}$$