Air regurgitation in patients on continuous positive airway pressure (CPAP) therapy following dacrocystorhinostomy with or without Lester–Jones tube insertion

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ABSTRACT

Aim To describe air regurgitation as a complication in patients on continuous positive airway pressure (CPAP) therapy for obstructive sleep apnoea (OSA) following dacryocystorhinostomy (DCR) surgery with or without Lester–Jones tube (LJT) insertion.

Methods A retrospective review of all patients with air regurgitation on CPAP therapy who previously underwent a DCR/LJT procedure. Patient demographics, lacrimal surgical history, CPAP therapy and outcome were recorded.

Results Four male patients were identified. The mean age at presentation was 54 years. Two patients had an LJT inserted, and two patients had a DCR procedure, one was external, and one was endonasal. All four patients had resolution of their epiphora. Three patients had superficial epithelial keratopathy requiring lubricant therapy. All patients attempted using ointment to act as a barrier over the neo-ostium, which was unsuccessful. One patient had the LJT removed with resolution of the air regurgitation. Two patients changed their CPAP machines to variable, and three patients reduced the pressure of their CPAP therapy without any improvement. All three patients had persistence of air regurgitation at a mean follow-up of 18 months.

Conclusions Air regurgitation can occur following naso-lacrimal surgery in patients on CPAP therapy. Although this is an unusual complication, it should be discussed with the patient at the time of obtaining informed consent.

INTRODUCTION

Continuous positive airway pressure (CPAP) therapy is the mainstay mode of treatment in moderate to severe obstructive sleep apnoea (OSA).[1] It creates a positive intraluminal pressure within the upper airways to maintain patency of the airways and prevent apnoeic episodes. Complications associated with CPAP have been previously described and range from conjunctivitis, mask discomfort, mask claustrophobia, air leaks, skin breakdown, nasal dryness, nasal congestion, epistaxis, pressure intolerance to areophagia.[2–4] A recent paper by Harrison *et al*[5] described anterior segment complications secondary to CPAP. They reported increase dryness, vascularised limbal keratitis, recurrent microbial keratitis and microbial conjunctivitis in three patients after commencing CPAP therapy.

Air regurgitation has not been well documented in the literature for patients on CPAP therapy with a previous history of naso-lacrimal surgery. It is postulated that the positive pressure in the upper airways created by the CPAP therapy forces air up through the enlarged naso-lacrimal ostium with its absence of the normal anatomical valves or through the glass tubing of the Lester–Jones tube (LJT). Although this may occur in a small group of patients, that is, patients on CPAP therapy and those with a previous dacryocystorhinostomy (DCR) with or without placement of a LJT, it is still a considerable irritant to the patients concerned. We report on air regurgitation as a complication in this subset of patients and discuss the possible management options available to reduce it.

MATERIAL/METHODS

This was a retrospective review of all patients complaining of air regurgitation while using CPAP therapy who previously underwent either an endonasal or external DCR or an LJT procedure under the care of a single ophthalmologist (DS) over a 10-year period. We recorded the patient's demographics, previous lacrimal surgical history with complications, CPAP therapy, air reflux complication, ocular symptoms and outcome at the last follow-up clinic visit. The institutional ethics review board deemed approval unnecessary for this retrospective study.

RESULTS

Four patients were identified in the study period, and all were males. The mean age at presentation of air reflux was 54 years (range 49–61 years). Two patients with canalicular obstruction and one patient with naso-lacrimal duct obstruction underwent an external DCR procedure (table 1). One of the patients with canalicular obstruction had retro-intubation of silicone stents at the time of the external DCR, and the second patient with canalicular obstruction underwent canalicular trephine with silicone stent intubation. The second patient with naso-lacrimal duct obstruction underwent endonasal DCR (table 1). The patients with the canalicular obstructions required further surgery involving placement of a Lester–Jones tube at a mean of 12 months (range 9–14 months) following the initial DCR surgery. The two patients with naso-lacrimal duct obstruction had a successful outcome following their DCR surgery and did not require further surgical intervention. All four patients had resolution of their epiphora at final follow-up.

Table 1 Primary diagnosis, initial and secondary surgical procedures, onset of constant positive airway pressure therapy, onset of air regurgitation and persistence of air regurgitation for all patients

Case	Primary diagnosis	Initial surgery	Secondary surgery	Constant positive airway pressure prior to surgery	Onset of air reflux (weeks)	Persistent air reflux
1	NLDO	Endo DCR no stents	No	Yes (48 m)	2	Yes
2	CO	Ext DCR+retrointubation	LJT	Yes (60 m)	1	No (LJT removed)
3	CO	Ext DCR+canalicular trephine+intubation	LJT	Yes (24 m)	2	Yes
4	NLDO	Ext DCR, no stents	No	No	1 (post-CPAP)	Yes

CO, canalicular obstruction; Endo DCR, endonasal dacryocystorhinostomy; Ext DCR, external dacryocystorhinostomy; JLT, Lester–Jones tube; NLDO, naso-lacrimal duct obstruction.

Three patients had commenced CPAP therapy prior to naso-lacrimal surgery, and one patient had commenced CPAP 12 months following naso-lacrimal surgery (table 1). All four patients used CPAP therapy with fixed delivery of positive pressure. The mean pressure of CPAP used was 9 cmH_2O (range 8–10 cmH_2O). One patient had nasal dryness, and one patient complained of a poor-fitting mask. Two patients used humidified CPAP machines.

Air regurgitation was regarded as a significant irritant in all four patients; this took the form of air blowing across their eye on the operated side, particularly on waking in the morning. One patient had difficulty sleeping with this symptom. The onset of the air regurgitation (table 1) was reported at the first postoperative visit (2 weeks) in one patient with naso-lacrimal obstruction. The second patient with naso-lacrimal reported the onset of the irritating symptom within the first week of commencing CPAP therapy 12 months after DCR surgery. In the cases of the two patients with canalicular obstruction who underwent silicone intubation, no air regurgitation was reported after the initial DCR surgery. The tubes were in situ for a mean of 13 weeks (range 12–14 weeks). They complained of air regurgitation following insertion of the LJT at an onset of 1–2 weeks. Three patients had evidence of superficial epithelial keratopathy and were treated with ocular lubricants. The other patient had a normal slit light examination. We did not find any environmental factors influencing the patients' symptoms, such as seasonal variation or temperature. All four patients were relieved of the air reflux when they stopped their CPAP therapy, but none of the patients could manage without it. Two patients changed to variable CPAP machines, and three patients reduced the pressure of their CPAP machines but had recurrence of their OSA, and none of these measures improved the symptom of air regurgitation. All patients applied a lubricating ointment in an attempt to temporarily 'occlude' the naso-lacrimal duct during the CPAP therapy; however, this did not have any beneficial effect. At a mean follow-up of 18 months (range 9–31 months), three patients found no improvement in air regurgitation, and one patient had resolution of the symptom on removal of the LTJ, without a recurrence of epiphora.

DISCUSSION

Herbert and Rose[6] have previously described air reflux as a complication following external DCR. They reported that it occurred in 20 out of 46 procedures (43%), but that 85% of patients were not concerned by the symptom. A number of patients had learnt to pinch the medial canthus to prevent air reflux when sneezing or blowing their nose. Indeed, some patients actually induced the air reflux and found it reassuring that the 'passage' was clear. Air reflux has been found to be the commonest compliant (41.6%) in patients who were dissatisfied with the outcome of endoscopic guided transcaruncular LJT intubation without DCR.[7] It was also cited as a reason for dissatisfaction in one patient after functionally successful conjunctivodacryocystorhinostomy LJT surgery.[8] Mulligan *et al*[9] describe the use of air regurgitation during the valsalva manoeuvre as a quick, clean and easy means of assessing lacrimal patency after DCR surgery. All four patients in our study found air regurgitation to be a significant inconvenience to them when they used CPAP therapy, and three patients had evidence of corneal dryness with superficial epithelial keratopathy, requiring lubricating drops.

The patient with OSA can frequently present to the eye clinic. The association between OSA and certain eye disorders such as floppy eyelid syndrome, optic neuropathy, glaucoma, non-arteritic anterior ischaemic optic neuropathy and papilloedema secondary to raised intracranial pressure is well recognised.[10] One paper reported that 16 out of 17 patients with a diagnosis of floppy eyelid syndrome were found to have OSA on sleep studies and advises ophthalmologists to be aware of the association.[11] The management of the OSA with CPAP therapy has been found to improve and/or stabilise the associated eye disorders such as floppy eyelid syndrome and visual-field defects in glaucoma.[10 12] All our patients were unable to discontinue their CPAP therapy.

There are various methods available to attempt to improve air regurgitation in patients on CPAP therapy. As in our patients, stopping the CPAP therapy is usually not an option, although all patients attempted this and had complete resolution of their air regurgitation. Other options include changing from nasal mask/prongs to a full face mask. This may reduce the air flow through the nose and through the naso-lacrimal ostium. If this fails, the air pressure may be altered. The majority of patients require an air pressure of 8–12 cmH_2O. There will be a number of patients who will not be able to tolerate a lower air pressure, with a return of apnoeic episodes and OSA symptoms. This occurred in three of our patients. Another approach in managing air regurgitation involves the use of a variable CPAP machine. This machine self-adjusts according to the varying resistance of the upper airways, so at times of deep sleep or change in posture, it can increase the delivery of air pressure. Two patients changed to this machine, but still the symptom persisted. Another technique employed was the nightly administration of a lubricating ointment to attempt a temporary 'occlusion' of the naso-lacrimal duct when using CPAP therapy. This was used in all four patients without success.

Cartwright and Frueh[13] described a patient with air regurgitation on CPAP following LJT surgery. The patient created an alginate mould which was fitted to his mask and used every night. The mould applied sufficient pressure to counteract the pressure gradient across the LJT arising from the continuous positive airway pressure at the nasal end of the LJT. It appeared to be rather bulky

and cumbersome; however it highlighted the measures patients will employ in an attempt to alleviate this symptom. Silicone intubation has been suggested as a possible treatment, as it may physically occlude the patent passage; we did not attempt this in our patients. A final measure is the removal of the LJT, which one of our patients opted for with resolution of the air regurgitation. This patient had no further epiphora.

The main limitation of this study lies in its retrospective nature with small numbers. However, this reflects the small subset of patients on CPAP therapy who have undergone naso-lacrimal surgery and complain of air regurgitation. There is little in the way of information for the ophthalmologist managing this patient, and most of the treatment options have arisen by 'trial and error.'

In conclusion, we have found that air regurgitation during CPAP therapy in patients with a history of naso-lacrimal surgery is a persistent irritating complication. There are a number of possible steps to reduce the symptoms, but they can have limited success. Some patients may prefer removal of the LJT with the possibility of recurrent epiphora than living with the air regurgitation. It is important to highlight this potential complication when discussing naso-lacrimal surgery in patients on CPAP therapy.

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