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APPARATUS

A comparison of the laryngeal mask airway and PA_{Xpress}™ for short surgical procedures

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Summary

Sixty adult patients undergoing minor peripheral surgery under general anaesthesia were randomly allocated to receive either the laryngeal mask airway (laryngeal mask airway; size 4 for females and size 5 for males) or the PA_{Xpress}™ (adult size), inserted by a single operator with experience of > 50 insertions of each device. The laryngeal mask airway was correctly placed on the first attempt in 27 patients (90%) compared with 20 patients (67%) when using the PA_{Xpress} ($p < 0.01$). No patient required more than two attempts at insertion and there were no failures with the laryngeal mask airway, compared with four (13%) who needed three attempts and two failures (7%) with the PA_{Xpress} ($p < 0.001$ and $p < 0.01$, respectively). Mean (SD) total placement time was shorter with the laryngeal mask airway [24.6 (3.1) s] than with the PA_{Xpress} [35.4 (2.5) s; $p < 0.01$]. The most common complication was sore throat, which occurred less frequently with the laryngeal mask airway (8 patients; 26%) than with the PA_{Xpress} (15 patients; 53.5%; $p < 0.001$).

Keywords *Equipment*; laryngeal mask airway, PA_{Xpress}.

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The PA_{Xpress}™ (Vital Signs Inc., Barnham, UK) is a supraglottic airway device with gills at the tip and an inflatable pharyngeal cuff proximal to the distal opening (open window) of the airway (Fig. 1). The gills and cuff are convex posteriorly and tapered distally, so as to be accommodated in the hypopharynx. This helps the open window to lie in close proximity to the glottic opening (Fig. 2).

The current 'gold standard' of a supraglottic airway device is the laryngeal mask airway (laryngeal mask airway), which forms a seal with the periglottic tissues [1]. The laryngeal mask airway has been compared with another supraglottic airway device, the cuffed oropharyngeal airway [2]. The aim of this study was to compare the ease and speed of placement and incidence of postoperative laryngopharyngeal morbidity of the laryngeal mask airway and the PA_{Xpress}.

Methods

Following departmental research board (research ethics committee) approval and informed consent, we studied 60 adult patients, ASA I–II and aged 20–40 years, undergoing minor peripheral surgery in the supine position. Patients with Mallampatti grade III and IV, and those with restricted jaw movement, postburn contractures of the neck, growths in the oral cavity, full stomach and moderate to severe cardiorespiratory disease were not studied. The patients were randomly divided (chit-in-box technique) into two groups of 30, to receive the laryngeal mask airway or PA_{Xpress}. A standard anaesthetic protocol was followed and routine monitoring applied. Anaesthesia was induced with propofol 2 $mg.kg^{-1}$ and neuromuscular blockade was achieved with vecuronium 0.1 $mg.kg^{-1}$.

All insertions of the airways were by a single operator (a consultant with experience of > 50 insertions of each device). Sizes 4 and 5 laryngeal mask airway were used in female and male patients, respectively. A PA_{Xpress} of universal adult size was used in both male and female patients, as only one size has been introduced by the manufacturer. A maximum of three attempts was allowed, with each attempt

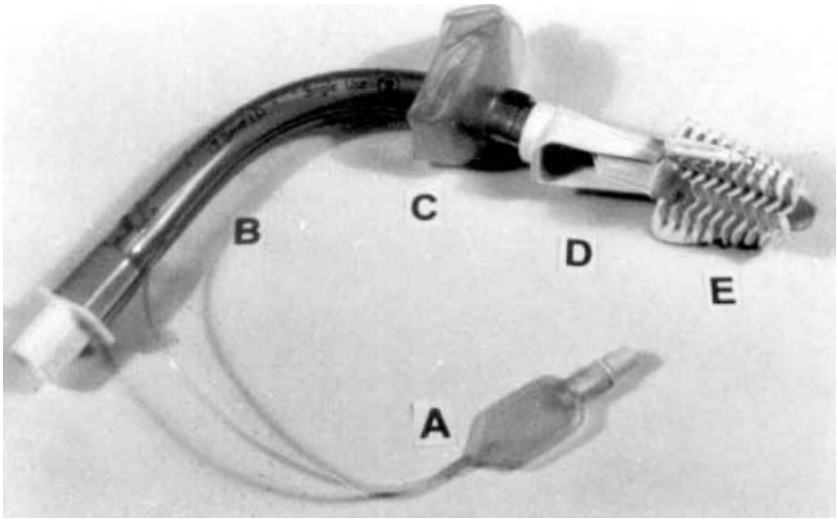

Figure 1 The PA_{Xpress}. A, Pilot balloon; B, tube; C, cuff; D, open window; E, gilled tip.

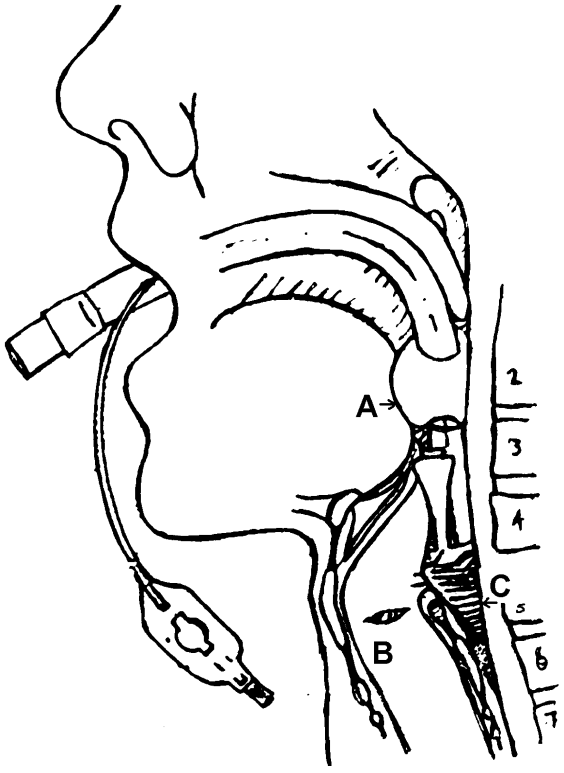

Figure 2 The PA_{Xpress} positioned correctly. A, Cuff; B, larynx; C, gilled tip in the oesophageal inlet.

lasting not more than 60 s. Oxygenation was permitted between attempts. The laryngeal mask airway was placed as described by the manufacturer [3]. The PA_{Xpress} was also placed as described by its manufacturer [4] as follows. First, the cuff was deflated slowly and smoothed completely in the proximal direction against the tube. The entire gilled tip and the cuff were lubricated except for the distal airway opening. After induction of anaesthesia and neuromuscular blockade, the patient's head was placed in the sniffing position and the device was held like a tracheal tube, such that the markings on the tube faced in the direction of the patient's upper lip. The PA_{Xpress} was then inserted with the gilled tip maintaining contact with the hard palate, and advanced directing the tip backwards and downwards along the patient's midline, maintaining contact with the hard and soft palate and the posterior pharyngeal wall until resistance was felt in the hypopharynx. Once resistance was noted, the PA_{Xpress} was gently withdrawn 0.5–1.0 cm to facilitate alignment of the device's open window in line with the glottis. The cuff was then inflated, initially with 30 ml air gradually increased to a maximum of 60 ml, to obtain an effective seal.

Placement of the airway was defined as easy (one attempt) or difficult (two or three attempts). If correct placement (easy ventilation at pressure < 18 cmH_2O) was not possible even after three attempts (failed insertion), the airway was secured with a cuffed tracheal tube and the patient was excluded from further follow-up. The duration of each attempt was recorded as the time from removal of the face mask to correct placement of the device or re-application of the face mask (failed attempt). The total time taken for insertion was defined as the sum of the durations of all attempts. At the conclusion of surgery and anaesthesia, the airway was removed when the patient started opening his/her eyes on command and showed adequate hand grip with smooth, regular thoracoabdominal respiration, with a train-of-four-ratio > 90%. Following removal of the airways, the oropharynx was examined with a laryngoscope for evidence of mucosal bleeding and lacerations. The airway device was also examined for any bloodstains. The nurses in the recovery area, who were unaware of the groups, were instructed to ask the patients for complaints of sore throat, hoarseness and dysphagia.

Statistical analysis was with the unpaired *t*-test and the test of significance of difference between two proportions, with a p-value of 0.05 taken as statistically significant.

Results

The patients in both the groups were comparable with respect to age, weight, sex and duration and type of surgery (Table 1). Ease of placement, placement times and complications are shown in Tables 2 and 3.

Discussion

We have shown that correct placement of the laryngeal mask airway took less time than with the PA_{Xpress}. Further, placement of the laryngeal mask airway required fewer attempts and was associated with a lesser incidence of trauma and postoperative complications.

Our experience with the laryngeal mask airway is in accordance with previous authors [2, 5], whereas our observations with the PA_{Xpress} could not be compared with others' as no published data are available. Although both are supraglottic devices, the difference in outcomes between them could be for two reasons. First, we were able to use appropriate sizes of laryngeal mask airway for males and females, whereas there is only one available adult size of PA_{Xpress} which may have been too large for the females, resulting in difficulty in proper alignment of the open window with the glottis. This is supported by the fact that we could not place the PA_{Xpress} in two patients, both of whom were females. Second, the PA_{Xpress} structurally appears to be a combination of a cuffed oropharyngeal airway with a pharyngeal gilled portion (Fig. 1). These two parts need to be accommodated at two different areas, the oropharynx and the hypopharynx (Fig. 2), making alignment of the open window and the glottis more difficult and leading to repeated attempts at insertion, and thus trauma.

Although the laryngeal mask airway is expensive, it is easier to place and is associated with less postoperative laryngopharyngeal morbidity than the PA_{Xpress}. However, further studies should be undertaken to compare the two devices once different sizes of the PA_{Xpress} are introduced to the market.

Table 1 Characteristics of patients receiving either the laryngeal mask airway or PA_{Xpress}, and type and duration of surgery. Data are given as mean (SD) or number.

	Laryngeal mask airway (n = 30)	PA_{Xpress} (n = 30)
Age; years	38.3 (10.5)	37.1 (8.6)
Weight; kg	45.4 (10.3)	48.3 (11.5)
Sex; M/F	19/11	20/10
Type of surgery:		
Ganglion removal	4	3
Incision/drainage of abscess	10	12
Amputation of toes	2	3
Wiring of digits	9	8
Release of carpal tunnel	4	2
Release of Dupuytren's contracture	1	2
Duration of surgery; min	28.8 (6.8)	30.4 (5.5)

Table 2 Ease of placement and times taken to place either the laryngeal mask airway or PA_{Xpress}. Data are given as number [%] or mean (SD).

	Laryngeal mask airway (n = 30)	PA_{Xpress} (n = 30)	p-Value
Placed on first attempt	27 [90]	20 [67]	< 0.01
Placed on second attempt	3 [10]	4 [13]	n.s.
Placed on third attempt	0	4 [13]	< 0.001
Failed insertion	0	2 [7]	< 0.01
Time for placement (first attempt); s	21.2 (3.4)	29.8 (4.1)	< 0.05
Time for placement (second attempt); s	18.3 (2.3)	24.3 (3.5)	n.s.
Time for placement (third attempt); s	0	20.7 (2.4)	< 0.001
Total placement time; s	24.6 (3.1)	35.4 (2.5)*	< 0.001

*n = 28 because insertion failed in two patients.

Table 3 Complications following placement of either the laryngeal mask airway or PA_{Xpress}. Data are number (%).

	Laryngeal mask airway (n = 30)	PA_{Xpress} (n = 28)*	p-Value
Sore throat	8 (26)	15 (5)	< 0.001
Hoarseness	1 (3)	2 (6)	n.s.
Dysphagia	0	1 (4)	< 0.05
Trauma	1 (3)	6 (21)	< 0.01

*n = 28 because two patients were excluded from follow-up after insertion failed.

References

1 McIntyre JWR. History of anaesthesia. Oropharyngeal and nasopharyngeal airways (1880–1945). *Canadian Journal of Anaesthesia* 1996; **43**: 629–35.

2 Greenberg RS, Brimacombe J, Berry A, Gouze V, Piantadosi A, Dake EM. A randomised controlled trial comparing the cuffed oropharyngeal airway and laryngeal mask airway in spontaneously breathing anesthetised adults. *Anesthesiology* 1998; **88**: 970–7.

3 Verghese C. *The LMA Instruction Manual*. Laryngeal Mask Company Limited, San Diego, California, USA, 1999.

4 *The PA$_{XPRESS}$. Instruction Manual*. Barnham, UK: Vital Signs Inc, 2000.

5 Brimacombe J. Analysis of 1500 laryngeal mask uses by one anaesthetist in adults undergoing routine anaesthesia. *Anaesthesia* 1996; **51**: 76–80.