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Haemodynamic response at double lumen bronchial tube placement - Airtraq vs. MacIntosh laryngoscope, a randomised controlled trial

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ABSTRACT

Introduction: Tracheal intubation causes a haemodynamic response that might be harmful for patients. The Airtraq® laryngoscope has been shown to decrease the haemodynamic response to single-lumen tube intubation. We hypothesised that double-lumen bronchial tube placement with the Double-lumen Airtraq® laryngoscope would cause a reduced haemodynamic response and decreased catecholamine release compared with the MacIntosh laryngoscope.

Methods: Forty adult patients were randomly assigned to the Airtraq® group or to the MacIntosh group. Intubation with either the Airtraq® or the MacIntosh laryngoscope was performed two minutes after standardised induction of anaesthesia. Arterial blood pressure, heart rate, catecholamine levels, bispectral index and duration of the intubation procedure were measured.

Results: Mean (standard deviation [95 % confidence interval]) systolic arterial blood pressure at laryngoscopy with the Airtraq® laryngoscope was 124 (34 [106 to 141]) mmHg and, with the MacIntosh laryngoscope, it was 110 (25 [99 to 122]) mmHg ($p = 1.0$). Heart rate at laryngoscopy with the Airtraq® laryngoscope was 75 beats · min-1 (16 [67 to 83]) and, with the MacIntosh laryngoscope, it was 64 beats · min-1 (14 [58 to 71]) ($p = 0.71$). Adrenaline levels post-intubation were 54.3 ng · l-1 (41.5) [29.3 to 79.4] in the Airtraq® group and 30.5 ng · l-1 (25.6) [15.1 to 46.0] in the MacIntosh group ($p = 0.016$). The duration of intubation with the Airtraq® laryngoscope was 88 s (31 [72-104]) while, with the MacIntosh laryngoscope, the duration was 75 s (35 [59-92]) ($p = 0.26$).

Conclusions: The use of the Double-lumen Airtraq® laryngoscope provides no benefit regarding stress response compared to the MacIntosh laryngoscope.

Keywords: *stress response, intubation, double-lumen-tube, haemodynamics.*

INTRODUCTION

Intubation can produce a major haemodynamic response that may be harmful in patients with cardiac, pulmonary or cerebral diseases. Some intubation devices (e.g. fibre optic devices, Glidescope™) have already been investigated to determine if they are able to attenuate the haemodynamic response to tracheal intubation, but the results remain controversial. The Airtraq® laryngoscope was originally designed to facilitate tracheal intubation in difficult-to-intubate situations. The Airtraq® laryngoscope provides an indirect view of the laryngeal structures similar to other alternative laryngoscopes such as the Gli-

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descope™. The image is transmitted by a combination of mirrors and prisms and an included heater prevents the lens from fogging. Steering of the tube is provided via a channel attached to the blade. The feasibility of double lumen-bronchial-tube (DLT) insertion with an Airtraq® laryngoscope was first described by Hirabayashi and an Airtraq® laryngoscope specially designed for DLT placement is now available (1).

Tracheal intubation with the Airtraq® laryngoscope designed for single lumen tracheal tubes seems to produce a less accentuated haemodynamic response than tracheal intubation with the MacIntosh laryngoscope, at least in obese patients (2). Therefore, intubation with the Airtraq® laryngoscope could be beneficial for patients at risk for cardiovascular events (e.g.patients undergoing cardiothoracic surgery). This possible benefit has been so far shown for tracheal intubation with a single lumen tube. In cardiothoracic surgery, single lung ventilation is frequently necessary to perform the operation and this usually requires the placement of a DLT. Placement of a DLT differs from the placement of a single lumen tube in several respects. For instance, most double lumen tubes are more rigid and much thicker than single lumen tubes and we feel that this makes the insertion of a DLT more difficult than the insertion of single lumen tubes. We also speculate that the pushing of the DLT down the trachea into one main bronchus creates more stimulus than a single-lumen tube intubation, where the tube ends in the middle of the trachea.

However, there are no data regarding the haemodynamic response to DLT intubation with conventional laryngoscopy or with an alternative device.

A recently published study focusing on the duration of intubation with the DLT Airtraq® laryngoscope found no superiority of the DLT Airtraq® laryngoscope over the conventional MacIntosh laryngoscope (3).

Our hypothesis was that intubation with the DLT-Airtraq® could provide similar haemodynamic advantages to those shown by Ndoko et al. (1) for single lumen tube intubation, although we were aware that DLT placement significantly differs from single lumen tube intubation. Thus, the aim of our study was to investigate the haemodynamic and catecholamine response at DLT placement with the DLT-Airtraq® laryngoscope compared to DLT placement with the conventional MacIntosh laryngoscope.

METHODS

Before we enrolled patients in our study, we obtained institutional ethics committee approval, registration at EudraCT (Ethics Committee of the Medical University Vienna, Ref.Nr. 549/2008, EudraCT Ref. Nr. 2008-006233-27) and written informed consent.

In previous studies with comparable protocols for induction of anaesthesia, systolic arterial blood pressure (SAP) at tracheal intubation was approximately 110 mmHg (20 mmHg SD) (1, 4). Assuming a type-1 error of 5 % and a 90 % chance to detect a difference in SAP at intubation of 20 % (22 mmHg) between the groups, 18 patients in each group were required. To keep the statistical power high, we enrolled 20 patients per group to account for a possible drop-out rate of 10 %. We included adult patients of ASA class 1-3 undergoing elective surgery with the need for DLT tube placement. Patients taking medication with anti-hypertensive or beta-blocking agents on the day of surgery were excluded because this may affect haemodynamic and catecholamine responses. Further exclusion criteria were cardiac arrhythmias and history of previous difficult intubation procedures, as these

may inappropriately prolong intubation attempts or require awake fibre-optic intubation.

Patients were randomised either to the MacIntosh group or the Airtraq® group. Therefore, group labels were written on a total of 40 cards (20 per group). The cards were put into opaque envelopes, effectively mixed, and put into a box. This was done by a person who was not involved in the study. After entering the operation room, an envelope was picked from the box, opened and the patient was assigned to the indicated group.

Patient´s demographic data (ASA-status, age, height, weight, gender) and the Mallampati Score were recorded after informed consent was received.

Patients received midazolam 7.5 mg p.o. 1 hour before induction of anaesthesia for premedication. All patients received 500 mL lactated ringer's solution prior to induction of anaesthesia.

According to our standard of care, invasive blood pressure monitoring (IBP), pulse oximetry (SpO2), electrocardiogram and bispectral index (BIS) were initiated in the operation theatre. After the initial measurements were recorded, patients were preoxygenated for several minutes with pure oxygen.

Anaesthesia was induced in all patients with a single bolus of midazolam 0.04 $mg \times kg^{-1}$, fentanyl 2 $\mu g \times kg^{-1}$, propofol 1.5 $mg \times kg^{-1}$ and rocuronium 0.6 $mg \times kg^{-1}$ over 60 seconds. After patient's loss of consciousness, bag mask ventilation with FiO_2 1.0 was started to maintain normocapnia and avoid hypoxia during the subsequent intubation procedure. The intubation procedure was started 2 min after the application of the induction agents. No further medication was given during the intubation attempt.

In the MacIntosh group, a MacIntosh laryngoscope with a curved blade of size 3 or 4 was used for laryngoscopy; the decision regarding what size was used was left to the personal experience of the performing anaesthetist. In the Airtraq® group, the yellow DLT-Airtraq® laryngoscope was used (Prodol Ltd, Vizcaya, Spain, product code Nr. A-071). For male patients a Ch 39 DLT was used and for female patients a Ch 37 left-sided DLT (Ruesch Austria, Vienna, Austria) was used. Intubation was performed by an anaesthetist with experience in DLT placement using the MacIntosh laryngoscope as well as using the DLT-Airtraq® laryngoscope. After placement of the DLT, it was immediately connected to the respirator and intra-tracheal/bronchial placement was confirmed via the respirator`s capnography (Draeger Primus, Draeger Medical Austria GmbH, Vienna, Austria). The placement of the DLT in the left main bronchus was checked and, if necessary, corrected after the study period was completed, in order to ensure that haemodynamic response was not affected by bronchoscopy or manipulation of the tube. If intubation was not possible at the first attempt (within 180 s or if SpO2 dropped below 92 %), patients were excluded from calculation.

Systolic- (SAP), diastolic- (DAP) and mean arterial blood pressure (MAP), heart rate (HR) and BIS were measured at predefined time points: baseline (prior induction of anaesthesia), post induction (immediately prior to laryngoscopy), at laryngoscopy (immediately prior to DLT insertion), at tube insertion (immediately after intubation was completed) and 1 and 2 min after intubation was completed. The measured values were recorded by screenshots of the monitor in the operation room at the specific time points. Time was measured to determine the duration of the laryngoscopy (from mouth opening for laryngoscopy until the anaesthetist started to insert the DLT) and the whole intubation procedure

(from mouth opening for laryngoscopy until the tube position was confirmed by capnography). Times and measured values were recorded by a study nurse. Blood samples for measurement of noradrenaline, adrenaline and dopamine in the plasma were taken at baseline (prior anaesthesia induction in the operation room) and post-intubation (2 min after intubation was completed). The blood samples were placed on ice and transported to the laboratory for further processing.

After the intubation, anaesthetists were interviewed about the view on the glottis according to the Cormack and Lehane Score, the difficulty of inserting the tube as a separate part of the whole intubation procedure and the difficulty of the whole procedure (very simple, simple, difficult, or very difficult).

Lastly, the position of the DLT was recorded via bronchoscopy and - if not in the left main bronchus - corrected afterwards.

Data were analysed with SPSS 19.0. (IBM SPSS Statistics, IBM Corp. NY, United States). The male/female distribution and comparisons of other nominal and ordinal data between the groups (ASA classification, Mallampati Score, Cormack and Lehane Score, difficulty of tube insertion and intubation procedure, position of the DLT) were tested with Fisher's exact test. Comparisons of further demographic data (age, weight, height), haemodynamic measurements (blood pressure, heart rate), BIS, time for laryngoscopy/intubation and catecholamine levels were tested with an ANOVA.

Where necessary, p-values were corrected for multiple testing with Bonferroni´s correction. P-values less than 0.05 were considered to be statistically significant.

RESULTS

A total of 40 patients were randomly assigned to the MacIntosh and Airtraq® groups. In the MacIntosh group, data from all allocated patients were analysed. In the Airtraq® group, data from 17 patients were analysed as shown in the CONSORT flow diagram.

Both groups were comparable with respect to ASA status, age, height, weight, gender distribution, Mallampati score and haemodynamic baseline values (*Table 1*).

After induction of anaesthesia, blood pressure dropped in both groups, then started to increase with laryngoscopy to its maximum immediately after intubation and declined at 1 to 2 min after intubation (*Figure 1*).

There were no statistically significant differences in absolute blood pressure or in the relative increase/decrease of blood pressure between the groups, at any time dur-

Table 1 - *Characteristics of patients who received double-lumen-bronchial tube insertion with either the MacIntosh or the Airtraq® laryngoscope. Values are the mean (SD) [95 % CI] or number (proportion).*

	MacIntosh (n = 20)	**Airtraq (n = 17)**
ASA status 1/2/3	8 (40 %) / 10 (50 %) / 2 (10 %)	9 (53 %) / 7 (41 %) / 1 (6 %)
Age, y	63.4 (9.3) [59.0 to 67.7]	56.8 (10.6) [51.3 to 62.2]
Height,cm	169.2 (10.0) [164.5 to 173.9]	171.4 (8.8) [166.9 to 175.9]
Weight,kg	71.3 (13.3) [65.1 to 77.5]	73.0 (18.9) [63.3 to 82.7]
Male/female	11 (55 %) / 9 (45 %)	9 (53 %) / 8 (47 %)
Mallampati Score 1/2/3/4	7 (35 %) / 10 (50 %) / 2 (10 %) / 1 (5 %)	4 (24.5 %) / 9 (53 %) / 4 (24.5 %) / 0

ASA = American Society of Anesthesiologists; SD = standard deviation; CI = confidence interval.

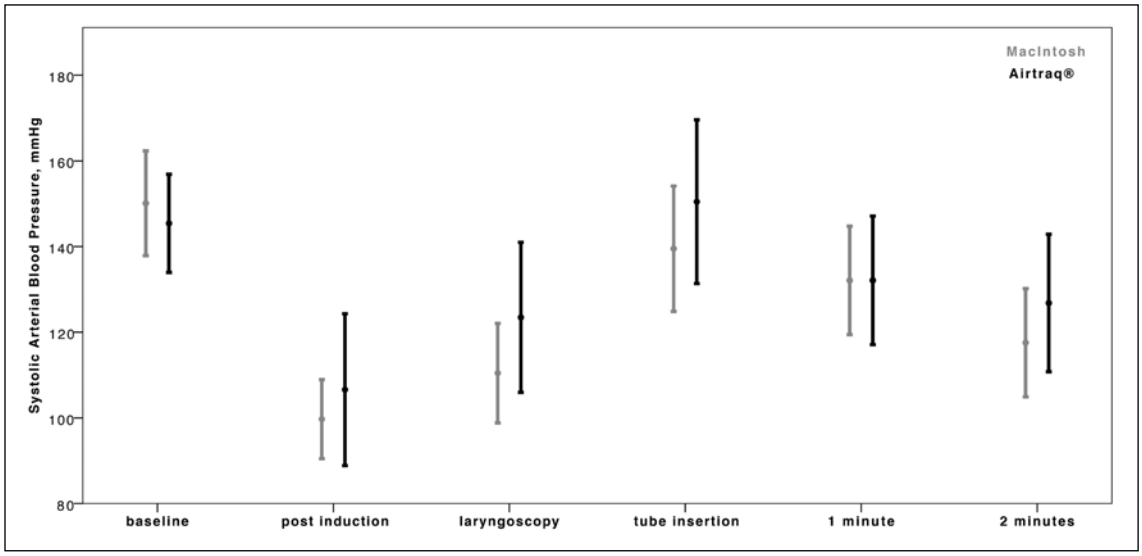

Figure 1 - *Course of systolic arterial blood pressure (mean, 95% CI) in patients using the MacIntosh (grey) or the Airtraq® (black) laryngoscope.*
CI = confidence interval.

ing the study period, with respect to systolic, diastolic or mean arterial blood pressure (*Table 2*).

Baseline heart rate, before anaesthesia was induced, was similar in both groups. Post-induction heart rate dropped in both groups without significant differences between the groups. With laryngoscopy heart rate increased and was higher in the Airtraq® group than in the MacIntosh group, but this difference was not statistically significant ($p = 0.71$). Immediately after the DLT was inserted, as well as 1 and 2 min afterwards, heart rate in the Airtraq® group was still higher than in the MacIntosh group, but again without statistical significance ($p = 0.35$, $p = 0.90$ and $p = 0.36$).

Figure 2 illustrates the course of heart rate through the study period; detailed data are provided in *Table 3*.

The bispectral index was comparable in both groups throughout the study period (*Table 4*).

The time anaesthetists needed to provide laryngoscopy, before they started to insert the DLT (22.3s vs. 31.8s; $p = 0.06$), as well as for the whole intubation procedure (75.4s vs. 88.1; $p = 0.256$s), tended to be longer in the Airtraq® group than in the MacIntosh group, but without statistical significance. The time needed to insert the DLT was comparable in both groups (*Table 5*).

Adrenaline increased through the study period in the Airtraq® group ($+11.1$ (71.2) [-31.9 to $+67.9$] ng $\times l^{-1}$) and decreased in the MacIntosh group (-76.6 (93.8) [-139.6 to -13.5] ng $\times l^{-1}$) (*Figure 3*). This difference in the course of the study period was statistically significant ($p = 0.02$).

Noradrenaline also increased in the Airtraq® group ($+24.6$ (147.6) [-54.0 to $+103.3$] ng $\times l^{-1}$) and decreased in the MacIntosh group (-87.5 (212.4) [-186.9 to $+11.9$] ng $\times l^{-1}$), but without statistical significance ($p = 0.08$). Dopamine decreased in both groups (Airtraq® group -22 (39.0) [-62.9 to $+18.9$] ng $\times l^{-1}$; MacIntosh group -8.9 (9.9) [-18.1 to $+0.4$] ng $\times l^{-1}$) without statistical significance ($p = 0.41$).

Table 2 - *Blood pressure at different time points in patients who received double-lumen-bronchial tube insertion with either the MacIntosh or the Airtraq® laryngoscope. Values are the mean (SD) [95 % CI].*

	MacIntosh (n = 20)	Airtraq (n = 17)	p-value
SAP baseline	150 (26) [138 to 162]	145 (22) [134 to 157]	1.0
MAP baseline	101 (17) [93 to 110]	101 (16) [92 to 109]	1.0
DAP baseline	75 (13) [69 to 81]	77 (14) [69 to 81]	1.0
SAP post induction	100 (20) [91 to 109]	107 (35) [89 to 124]	1.0
MAP post induction	73 (12) [67 to 78]	74 (11) [69 to 124]	1.0
DAP post induction	56 (11) [50 to 61]	57 (10) [52 to 63]	1.0
SAP laryngoscopy	110 (25) [99 to 122]	124 (34) [106 to 141]	1.0
MAP laryngoscopy	80 (18) [73 to 89]	89 (23) [77 to 101]	1.0
DAP laryngoscopy	61 (16) [53 to 68]	70 (20) [60 to 81]	0.6
SAP tube insertion	140 (31) [125 to 154]	151 (37) [131 to 170]	1.0
MAP tube insertion	100 (22) [89 to 110]	109 (29) [94 to 124]	1.0
DAP tube insertion	76 (17) [68 to 84]	84 (20) [74 to 95]	1.0
SAP 1 min	132 (27) [120 to 145]	132 (29) [117-147]	1.0
MAP 1 min	94 (20) [85 to 103]	96 (21) [86 to 107]	1.0
DAP 1 min	73 (15) [65 to 80]	75 (14) [67 to 82]	1.0
SAP 2 min	118 (27) [105 to 130]	127 (31) [111 to 143]	1.0
MAP 2 min	83 (18) [75 to 92]	95 (25) [83 to 108]	0.6
DAP 2 min	65 (13) [59 to 71]	73 (15) [66 to 81]	0.42

SAP = systolic arterial blood pressure; MAP = mean arterial blood pressure; DAP = diastolic arterial blood pressure. SD = standard deviation; CI = confidence interval.

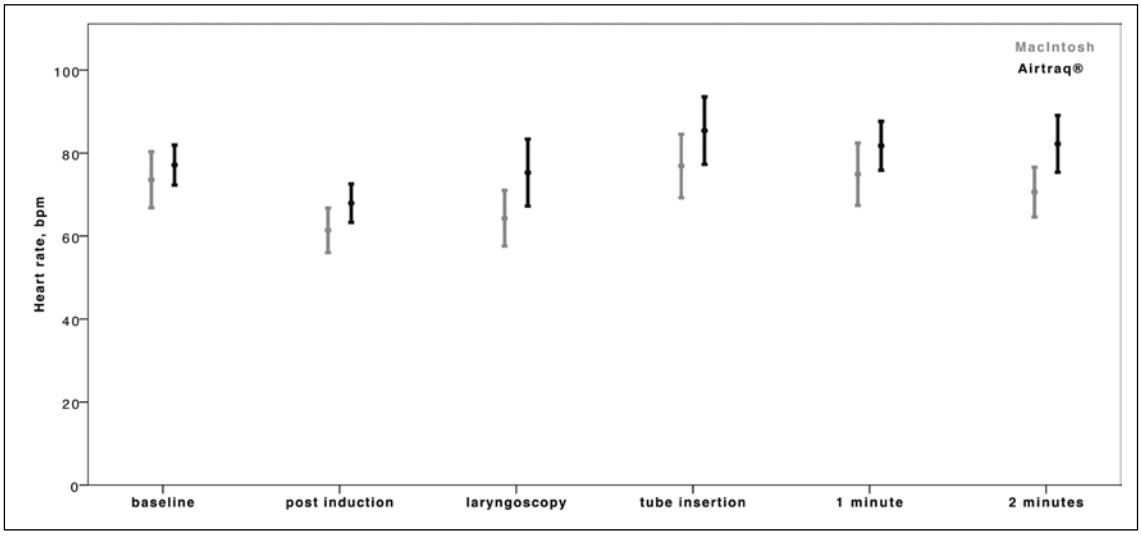

Figure 2 - *Course of heart rate (mean, 95 % CI) in patients using the MacIntosh (grey) or the Airtraq® (black) laryngoscope. CI = confidence interval.*

Table 3 - *Heart rate and catecholamine levels at different time points in patients who received double-lumen-bronchial tube insertion with either the MacIntosh or the Airtraq® laryngoscope. Values are the mean (SD) [95 % CI]. The concentrations of noradrenaline, adrenaline and dopamine are given in ng×l^{-1}.*

	MacIntosh (n = 20)	**Airtraq (n = 17)**	**p-value**
HR baseline	74 (15) [67 to 80]	77 (9) [72 to 82]	1.0
HRpost induction	61 (12) [56 to 67]	68 (9) [63 to 73]	0.39
HR laryngoscopy	64 (14) [58 to 71]	75 (16) [67 to 83]	0.71
HRtube insertion	77 (16) [69 to 84]	85 (16) [77 to 94]	0.35
HR 1 min	75 (16) [67 to 82]	82 (12) [76 to 88]	0.9
HR 2 min	71 (13) [65 to 77]	82 (13) [75 to 89]	0.36
Noradrenaline baseline	307.7 (290.0) [172.0 to 443.4]	233.4 (162.3) [150.0 to 316.9]	0.71
Noradrenaline post intubation	220.2 (133.8) [157.6 to 282.8]	258.0 (152.7) [180.6 to 343.4]	0.78
Adrenaline baseline	107.1 (84.9) [36.1 to 120.5]	43.2 (36.5) [25.5 to 63.0]	0.27
Adrenaline post intubation	30.5 (25.6) [15.1 to 46.0]	54.3 (41.5) [29.3 to 79.4]	0.18
Dopamine baseline	24.7 (17.2) [14.3 to 35.1]	34.1 (33.4) [3.2 to 65.1]	0.82
Dopamine post intubation	15.8 (8.7) [11.1 to 24.4]	12.1 (15.0) [6.3 to 31.3]	1

HR = heart rate min^{-1}; SD = standard deviation; CI = confidence interval.

Table 4 - *Bispectral index at different time points in patients who received double-lumen-bronchial tube insertion, measured with either the MacIntosh or the Airtraq® laryngoscope. Values are the mean (SD) [95 % CI].*

	MacIntosh (n = 20)	Airtraq (n = 17)	p-value
BIS post induction	23.3 (9.0) [18.8-27.8]	25.2 (5.6) [22.4-28.1]	1.0
BIS laryngoscopy	23.0 (8.3) [18.9-27.1]	27.4 (6.8) [23.9-30.9]	0.56
BIS tube insertion	27.2 (10.2) [22.1-32.2]	28.5 (6.3) [25.3-37.8]	1.0
BIS 1 min	25.0 (12.8) [19.0-31.0]	29.5 (12.8) [22.9-36.0]	1.0
BIS 2 min	25.2 (12.8) [19.2-31.1]	30.5 (10.5) [25.1-35.9]	1.0

BIS = Bispectral index; SD = standard deviation; CI = confidence interval.

Baseline catecholamine levels in the Airtraq® and the MacIntosh group were comparable, as were catecholamine levels post-intubation (2 min after intubation was completed) (*Table 3*).

In the Airtraq® group, a Cormack-Lehane-Score of 1 or 2 was present in 100 % of patients. In the MacIntosh group, a Cormack-Lehane Score of 1 or 2 was present only in 80 % of patients, but this difference did not reach statistical significance (*Table 5*). The difficulty of inserting the DLT, as part of the whole intubation procedure, was comparable in both groups (*Table 5*). The whole intubation procedure was determined "difficult" or "very difficult" in 6 % of patients within the Airtraq® group and in 20 % within the MacIntosh group, without reaching a statistically significant difference. Correct DLT positioning in the left main bronchus was achieved only in 71 % of patients in the Airtraq® group and in 95 % of patients in the MacIntosh group, again without reaching statistical significance.

Table 5 - *Characteristics of the intubation procedure in patients who received double-lumen-bronchial tube insertion with either the MacIntosh or the Airtraq® laryngoscope. Values are the mean (SD) [95 % CI] or number (proportion).*

	MacIntosh (n = 20)	Airtraq (n = 17)	p-value
Time for laryngoscopy, s	22 (13) [16-28]	32 (17) [23-41]	0.06
Time for tube insertion, s	59 (52) [35-83]	56 (30) [41-72]	0.84
Time for intubation, s	75 (35) [59-92]	88 (31) [72-104]	0.26
Cormack-Lehane Score 1/2/3/4	15 (75 %)/1 (5 %)/3 (15 %)/1 (5 %)	16 (94 %)/1 (6 %)/0/0	0.28
Tube insertion was: easy/difficult*	16 (80 %)/4 (20 %)	13 (76 %)/4 (24 %)	1.0
Intubation was: easy/difficult*	16 (80 %)/4 (20 %)	16 (94 %)/1 (6 %)	0.35
Tube position correct/ incorrect†	19 (95 %)/1 (5 %)	12 (71 %)/5 (29 %)	0.08

**"easy" includes: "very simple" and "simple"; "difficult" includes: "difficult" and "very difficult"; †"correct" in the left main bronchus, "incorrect" any position other than in the left main bronchus. SD = standard deviation; CI = confidence interval.*

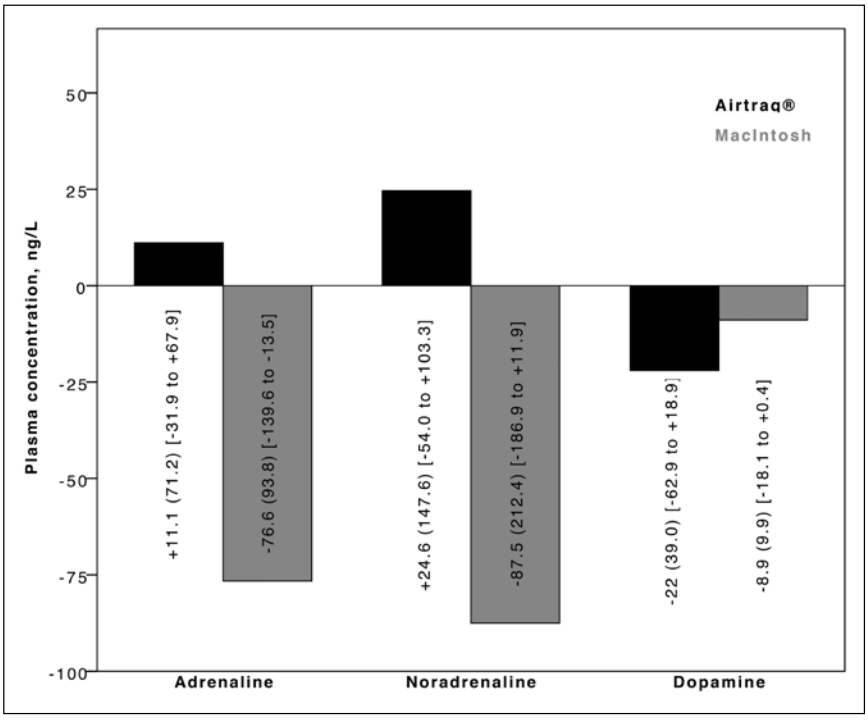

Figure 3 - *Changes in catecholamine concentrations through the study period (post intubation minus baseline levels) in patients receiving DLT intubation with either the MacIntosh- (grey) or the Airtraq® (black) laryngoscope. Values are the mean (SD) [95 % CI]. DLT = double lumen-bronchial-tube; SD = standard deviation; CI = confidence interval.*

DISCUSSION

The most important finding in our study is that there was no clear benefit of the DLT-Airtraq® laryngoscope in blunting the haemodynamic response due to DLT intubation compared to the MacIntosh laryngoscope.

Theoretically, less force to the tongue and the supraglottic tissue by indirect laryngoscopy (e.g., fibre optic bronchoscopy, intubation laryngeal mask, glidescope, etc.) should result in attenuated haemodynamic response to intubation. However, data supporting this theory are limited and controversial (4-8). Our hypothesis was that

the use of the Airtraq® laryngoscope for DLT placement instead of the MacIntosh laryngoscope would attenuate the haemodynamic response by reducing the force needed for laryngoscopy. This hypothesis could not be confirmed by our study. In fact, there even was a tendency towards a higher heart rate and higher catecholamine concentration in the Airtraq® group, suggesting an enhanced stress response in patients of the Airtraq® group compared with the MacIntosh group.

An explanation for this tendency may be that the duration of the laryngoscopy was a little bit longer in the Airtraq® group than in the MacIntosh group (without reaching statistical significance). Equal or higher time needed for DLT intubation with the Airtraq® laryngoscope was also recently found by Wasem et al. (3). In contrast, Di Marco found that intubation with the Airtraq® laryngoscope, designed for single lumen tubes, was easier and faster than with the conventional MacIntosh laryngoscope (9).

However in our study, as well as in Wasem´s study, DLTs were used and time for intubation was similar in both groups. We believe that the benefit of having a good view of the glottis with the Airtraq® laryngoscope is outweighed by the difficulty of inserting the large and stiff DLT, which results in a comparable duration of the intubation procedure.

In contrast with our results, Ndoko et al. reported significantly lower blood pressure and heart rate values at laryngoscopy with the Airtraq® laryngoscope than with conventional laryngoscopy (1) in obese patients. This result is in contrast with the findings of our study and may be explained by the fact that morbidly obese patients are prone to difficulties with conventional intubation. The Airtraq® laryngoscope was primarily designed to facilitate DLT intubation under difficult conditions, leading to shorter duration of the intubation procedure and, consequently, a reduced haemodynamic response. In our study, patients with a history of difficult intubation were excluded and most of the patients had a Mallampati score of 1 or 2.

Although the view of the glottis tended to be better with the Airtraq® laryngoscope than with the MacIntosh laryngoscope, no significant differences were observed.

Therefore, the main advantage of the Airtraq® laryngoscope, which is a better view of the glottis in patients who are difficult to intubate, played no role in our study.

A limitation of our study is that complications related to intubation (such as tongue or lip oedema, evidence of blood, and sore throat) were not recorded.

Therefore, we cannot draw any conclusion regarding whether the Airtraq® laryngoscope provides fewer such complications than the MacIntosh laryngoscope. Only a small number of ASA class 3 patients were included in our study and it is unclear if in this higher risk group haemodynamic and stress response differ from the responses noted in American Society of Anesthesiologists (ASA) class 1 and 2 patients. So, there is the possibility that, in this higher risk group, one laryngoscope might actually be superior to the other.

Also the measured catecholamine levels provide a limitation, because of their wide variability and somewhat confusing courses. For instance, in some patients of the same group, catecholamine levels increased from baseline to post-intubation, whereas in others, they decreased. Additionally, noradrenaline and adrenaline levels increased in the Airtraq®-group while dopamine levels decreased in both groups. One explanation for these findings might be that the half-lives of catecholamines are very short and even minor differences in timing of drawing blood probes could affect these results.

Processing of the probe might also influence catecholamine levels measured: for instance, transportation into the laboratory was out of our control in this study.
However, because we cannot adequately explain these findings these results should be interpreted with caution.

CONCLUSION

As found in previous studies, we believe that the insertion of the endotracheal tube is usually the major cause of the haemodynamic response and outweighs the stimulus of laryngoscopy, at least in unchallenging laryngoscopies (10, 11).
We speculate that the insertion of a thick and rigid bronchial tube would therefore usually be able to diminish any differences in the haemodynamic response caused by laryngoscopy, regardless of which technique for laryngoscopy is used.
The routine use of the DLT-Airtraq® laryngoscope for DLT placement provides no benefit regarding haemodynamic response compared with the MacIntosh laryngoscope. In patients with predicted difficult airway, laryngoscopy may contribute more to the haemodynamic response and the usefulness of the DLT-Airtraq® laryngoscope in these patients has yet to be determined.

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