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RESEARCH ARTICLE

Can the Fluctuation Observed in the Endotracheal Tube with Compression Applied to the Epigastric Region be Used as a Confirmation Method for Endotracheal Intubation?

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Abstract:

Background:

The traditional methods are mostly used to detect tracheal localization and to exclude esophageal localization. Therefore, the aim of this study was to investigate the usefulness of epigastric manual compression in the confirmation of esophageal placement of the tube.

Methods:

Out-of-hospital ETE was performed by experienced paramedics working in the emergency ambulance service, while ETE in the emergency department was performed by emergency medicine residents or emergency medicine specialists with at least 2 years of emergency department experience. Epigastric compression was performed by applying pressure to the epigastric region at least three times (in 5 sec) with the volar side of the intubated patient while the patient was ventilated with a balloon-valved mask. Immediately after ETI was performed, Ultrasonography (USG) was performed as the gold standard confirmation method. If a double path sign was observed and the pleural sliding motion was not seen, it was considered unsuccessful.

Results:

A total of 78 patients were included in the study (an equal number of successful and unsuccessful ETE applications). Approximately 59% (n=46) of the patients were female, median age was 73 years (64-80), and 22(28.2%) patients were intubated due to traumatic etiology. The specificity and sensitivity of epigastric fluctuation for esophageal intubations were 83.33% and 60%, respectively. The positive predictive value was 92.31%, and the negative predictive value was 38.46%. Epigastric auscultation airflow sound had a specificity of 86.96% and a sensitivity of 65.45% for esophageal intubation.

Conclusion:

Although the fluctuation that occurs in the tube with epigastric compression is not as sensitive and specific as USG, it is a better method than lung auscultation.

Keywords: Endotracheal intubation, Intubation, Esophageal placement, Epigastric fluctuation, Balloon-valved mask, Chest X-ray, CPR.

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1. INTRODUCTION

Endotracheal Intubation (ETI) is an intervention that aims to protect and maintain the airway of critically ill patients in and out of the hospital. While the most important and longest step of the procedure is the preparation phase, one of the most critical phases is the verification of the procedure. Although the most reliable method is thought to be direct observation of the tube passing between the vocal cords, this may not always be possible, especially in difficult intubations [1]. Confirmation of tube placement is necessary to ensure airway continuity and to prevent interruption of oxygenation, and inappropriate placement may lead to severe hypoxemia, neurological sequelae, and death [2]. There are many methods used to confirm the location of the tube. These include auscultation of

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lung sounds, auscultation of the epigastric region in the absence of airflow, observation of chest expansion after ventilation, measurement of end-tidal carbon dioxide pressure (PETCO2) by capnography or capnometry, imaging methods [(chest x-ray, thorax tomography), bronchoscopy, and USG], and observation of water vapor in the endotracheal tube [1 - 3]. All these methods have advantages and disadvantages [1 - 10]. Auscultation of lung sounds is a quick and practical method, but it may be misleading because the tube placed in the stomach can also be heard. Auscultation of the epigastric region may be helpful in detecting a misplaced tube in the stomach, but it alone does not prove the correctness of intubation. Observation of chest expansion does not require extra equipment, but is not reliable as chest movements can also be seen in oesophageal intubation. Additionally, observation of water vapour in the tube is a non-invasive and easily applicable method, but it may be misleading because water vapour may also be formed in gastric intubation. SpO2 <95% may also be considered as an indicator of intubation failure [4]. PETCO2 measurement, which has been frequently emphasized with its high sensitivity in recent years, has the possibility of false negative results in massive pulmonary embolism events where pulmonary blood flow is interrupted [2], along with false positive results in supraglottic locations [3]. It is advocated that the use of USG is a faster and safer method for confirmation, but it is user-dependent and may not be available in all settings [4].

ETE may also need to be performed outside the hospital as an advanced airway management [5]. In such cases, methods, such as imaging methods, ultrasound, or capnography may not be available, and only traditional methods, such as auscultation of lung sounds, auscultation of the epigastric region without hearing airflow, observation of chest expansion after ventilation, observation of water vapor in the tube might be used [1 - 3, 5 - 10]. Despite the use of various observational methods and equipment, it is important to keep in mind that errors may still occur. Therefore, it is recommended to confirm correct intubation through more than one verification method.

Especially in disaster situations where technological infrastructure is not available and sometimes outside the hospital, the use of traditional methods based on examination may be of vital importance. The traditional methods mentioned above are mostly used to detect tracheal localization and to exclude esophageal localization. In the observations in patients with cardiopulmonary arrest, we noticed that in the case of esophageal placement of the tube, manual compression of the epigastric region produced a fluctuation in the tube and its valved balloon, caused by the airflow. This fluctuation creates an increase in airway pressure and vibration in the balloon when ventilating the patient. This could be a method to confirm esophageal placement. This study was conducted to investigate the usefulness of epigastric manual compression in the confirmation of esophageal placement of the tube. The study aimed to answer the question: "Can the tube position be confirmed by the epigastric manual compression method in addition to the currently used confirmation methods?"

2. METHODS

This study was performed prospectively in the emergency department of a tertiary hospital. Ethics committee approval was obtained from the Ethics Committee of Düzce University (Date: 18/01/2021, Decision no: 2021/05). The relatives of the participants included in the study were informed about the procedure, and written informed consent was obtained. For intubation procedures performed prior to hospital admission, patients were first brought to the resuscitation room, where assessments were conducted while Cardiopulmonary Resuscitation (CPR) was ongoing. Consent was obtained from family members during resuscitation for those who arrived without prior intubation. However, airway management was prioritized to prevent delays in ventilation. The procedure did not pose any additional risk compared to the routine procedure (Clinical Trial No: NCT06542406).

2.1. Participants

Patients admitted to the emergency department between 01/05/2021 and 30/05/2022, who were older than 18 years of age and who underwent ETE outside the hospital or within the first hour of arrival to the emergency department, were included in the study. Patients in whom ETE was previously confirmed by USG or PETCO2, those who required elective intubation, those referred from another center, and those with known airway stenosis were excluded from the study. According to the literature, >80% of ETE applications are successful on the first attempt [10, 11], and this rate is 70% for out-of-hospital cardiac arrest cases [5]. In this department, an average of 300 ETE procedures are performed annually with a similar success rate. With a 90% confidence interval and a 5% margin of error, the sample size was calculated as 74. Therefore, to include an equal number of successful and unsuccessful ETE procedures, the first 40 successful and the first 40 unsuccessful ETE procedures were included in the study. One participant from each group was excluded due to missing data (Fig. **1**).

2.2. Workflow

Patients who underwent ETE outside the hospital or within the first hour of arrival to the emergency department were evaluated after the procedure. Out-of-hospital ETE was performed by experienced paramedics working in the emergency ambulance service, while ETE in the emergency department was performed by emergency medicine residents or emergency medicine specialists with at least 2 years of emergency department experience. Out-of-hospital procedures were evaluated upon the patient's first visit to the emergency department, and in-hospital procedures were confirmed immediately after the ETE.

Confirmation was performed in a single-blind manner by emergency medicine specialists with at least 5 years of experience, without knowing who performed the procedure or whether it was performed in or out of the hospital. The confirmation process included auscultation of lung sounds (from the anterior and lateral sides of both lungs, upper and lower zones), inspection for equal thoracic movement during breathing, auscultation of the epigastric region, placement of capnography, monitoring for water vapor in the tube, manual compression of the epigastric region at least three times to evaluate tube fluctuation, and pulse oximetry monitoring.

Epigastric compression was performed by applying pressure to the epigastric region at least three times with the volar side of the intubated patient while the patient was ventilated with a balloon-valved mask (Ambu™) (The procedure should be performed in a maximum of 5 seconds). During this procedure, the fluctuation of the air and fluid in the stomach inside the esophageal tube can be observed, and its sound can be heard. This can be detected from the first inhalation.

The USG procedure was evaluated by placing a linear ultrasound probe [SonoSite M-Turbo linear probe (13-6 MHz), Sonosite, Inc., Bothell, WA, USA] in the transverse position on the anterior side of the neck, just above the suprasternal notch. The position of the tube was observed by checking for the presence of a double path sign and pleural sliding movement. When the tube is in the trachea, a single semicircular echogenic area is observed, whereas a second semicircular echogenic area is seen when the tube is located in the esophagus [7]. USG was performed immediately after the ETE procedure. If the double path sign was observed and the pleural sliding motion was not seen, the patient was re-intubated by the experienced specialist performing the USG, and confirmation was performed again using USG. These procedures were categorized as "failed."

ETCO2 measurement by capnography was performed using a mainstream EMMA® Capnograph (PHASEIN AB, Svärdvägen, Danderyd, Sweden) for intubated patients. It was assessed by detecting PETCO2 greater than 5 mmHg after five breaths and the appearance of a typical square waveform [8, 9].

2.3. Statistical Analysis

Descriptive statistics were presented as numbers and percentages. Demographic data were presented as mean± standard deviation (SD) for normally distributed variables and median IQR (25-75%) for non-normally distributed variables. Pearson's chi-square test and Fisher's exact test (when the expected number of cells was less than five) were used for independent categorical variables. Bonferroni correction was used for subgroup analyses, and $p<0.016$ was considered significant. Sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, positive predictive value, and negative predictive value were calculated at 95% CI for the index tests of gastric compression fluctuation, epigastric sound, and lung sounds based on the reference test of ultrasound confirmation. Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, 2017). A *p*-value less than 0.05 was considered statistically significant.

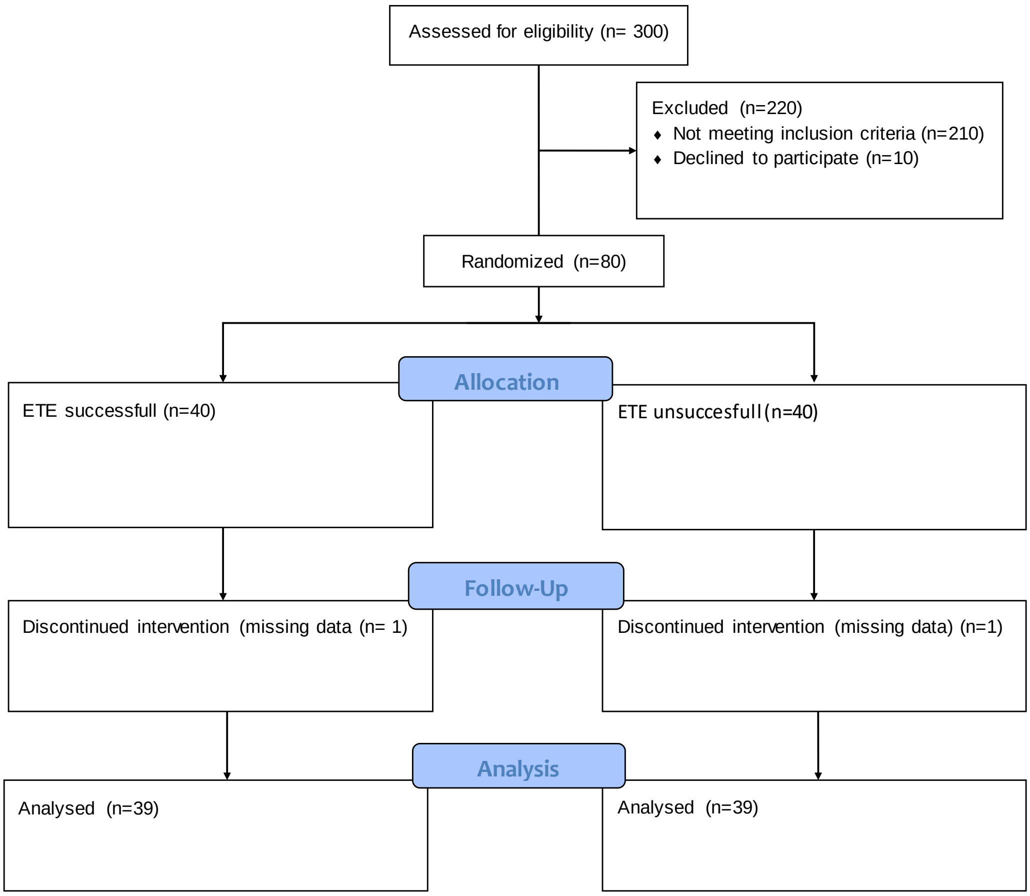

Fig. (1). Chart flow.

3. RESULTS

A total of 78 patients were included in the study (an equal number of successful and unsuccessful ETE applications). Approximately 59% (n=46) of the patients were female, median age was 73 years (64-80), and 22(28.2%) patients were intubated due to traumatic etiology. Approximately 87.2% (n=68) of patients were intubated by physicians. The epigastric voice was noted in 23(29.5%) patients, and fluctuation with epigastric compression was noted in 18(23.1%) patients (Table **1**). All patients with trauma etiology were in the ETE failure group. Of the successful patients, 48.7% (19/39) were female and 51.3% (20/39) were male; of the unsuccessful patients, 33.3% (13/39) were female and 66.7% (26/39) were male. Gender distribution was not different between the two groups (p=0.250).

Table 1. Descriptive data.

Parameter	**Value n (%)**
Confirmation with USG	-
Successful	39(50)
Failed	39(50)
Gender	-
Male	32(41)
Female	46(59)
Age [Median(IQR 25-75)]	73(64-80)
Reason for arrival	-
Non-trauma	58(71,8)
Trauma	22(28,2)
Person Making the Initiative	-
Doctor	68(87.2)
Paramedic	10(12.8)
Epigastric Voice	-
Yes	23(29.5)
No	55(70.5)
Fluctuation with Epigastric Compression	-
Yes	18(23.1)
No	60(76.9)

The epigastric fluctuation was more common in those who failed the test [n=15 (83.3%), $p<0.05$)]. Epigastric auscultation airflow sound was more common in those who failed [n=20(87%), $p<0.05$)]. On the other hand, lung sounds could be detected in 37.9-39.1% of failed intubations ($p<0.05$) (Table **2**).

3.1. Methods Used to determine ETE Failure

The sensitivity of the epigastric compression fluctuation test was found to be 60% (46.54% - 72.44%), and the specificity was found to be 83.33% (58.58% - 96.42%). The positive probability ratio was calculated as 3.6 (1.26 - 10.32), and the negative probability ratio was 0.48 (0.33 - 0.7). The positive predictive value was 92.31% (80.71% - 97.18%), while the negative predictive value was determined as 38.46% (30.1% - 47.56%). The sensitivity of the presence of epigastric sound was calculated as 65.45% (51.42% - 77.76%), and the specificity was calculated as 86.96% (66.41% - 97.23%). The positive probability ratio was determined as 5.02 (1.72 - 14.67), and the negative probability ratio was 0.4 (0.27 - 0.59). The positive predictive value was 92.31% (80.41% - 97.23%), and the negative predictive value was 51.28% (41.45% - 61.02%) (Table **3**).

3.2. Methods Used to determine ETE Success

The sensitivity of the right upper lung sounds was found as 100% (90.97% - 100%), and the specificity was found as 38.46% (23.36% - 55.38%). The positive probability ratio was 1.63 (1.27 - 2.09), and the negative probability ratio was calculated as 0. The positive predictive value was 61.9% (55.91% - 67.56%), while the negative predictive value was 100%. For right lower lung sounds, sensitivity was found as 100% (90.97% - 100%), and specificity was 35.9% (21.2% - 52.82%). The positive probability ratio was 1.56 (1.23 - 1.97), and the negative probability ratio was 0. Positive predictive value was determined as 60.94% (55.23% - 66.36%) and negative predictive value as 100%. For left upper lung sounds, sensitivity was found at 92.31% (79.13% - 98.38%) and specificity at 43.59% (27.81% - 60.38%). The positive probability ratio was calculated as 1.64 (1.23 - 2.19), and the negative probability ratio was calculated as 0.18 (0.06 - 0.57). The positive predictive value was 62.07% (55.04% - 68.63%), and the negative predictive value was 85% (64.34% - 94.68%). For left lower lung sounds, sensitivity was 92.31% (79.13% - 98.38%), and specificity was 41.03% (25.57% - 57.9%). The positive probability ratio was 1.57 (1.19 - 2.07), and the negative probability ratio was 0.19 (0.06 - 0.6). The positive predictive value was 61.02% (54.27% - 67.37%), and the negative predictive value was 84.21% (62.8% - 94.4%). In particular, the negative predictive value of not hearing right lung sounds for tracheal intubation was 100% (Table **3**).

4. DISCUSSION

Unrecognized episodes of esophageal intubation can lead to brain damage and death due to profound hypoxemia. Such events may occur regardless of clinical experience. Current evidence suggests that unrecognized esophageal intubation is more common than expected and requires a comprehensive approach to address it. The harm caused by delays in detecting esophageal intubation can only be prevented by reducing its occurrence and ensuring immediate detection and treatment when it is identified.

ETE for airway management should focus on early confirmation of esophageal intubation. The sensitivity and specificity of epigastric fluctuation are close to epigastric auscultation, which is a traditional method. In addition, these two methods are more specific than lung auscultation in determining tube position. Epigastric fluctuation and epigastric auscultation have a higher positive predictive value than lung auscultation for tube location.

ETE is performed to ensure permanent airway patency, which is a very important procedure for the life of critically ill patients. After the necessary preparations are completed and ETE is performed in the appropriate position, determining the tube location is of vital importance. There are many known and practiced methods for this and one of them is USG. USG is a very powerful option for intubation confirmation. The presence of a "double track sign" excludes tracheal intubation, whereas seeing a “lung shift” may exclude esophageal intubation [12]. Chen *et al*. found that bedside USG has a sensitivity of 75%, specificity of 100%, positive predictive value of 100%, and negative predictive value of 97.2% in ETE confirmation [13]. Chowdhury *et al*. found the sensitivity of USG for ETE confirmation to be 97% and specificity to be 100% [4]. In their meta-analysis, Li *et al*. reviewed 38 studies and evaluated a total of 3,268 cases. In this study, the sensitivity and specificity of USG for ETE confirmation were found to be 98% and 95%, respectively [14]. However, “optician dependence,” which is one of the main limitations in all studies performed with USG, is also valid here [12]. In addition, the use of USG in the out-of-hospital setting is not common. Therefore, other methods are used more frequently outside the hospital.

Table 2. Comparison of ultrasonography with other methods.

Parameter	Confirmation with USG		Total	*p*-value
	Successful	Failed		
Fluctuation with Epigastric Compression	-	-	-	0.001
Yes	3(%16.7)	15(%83.3)	18	
No	36(%60)	24(%40)	60	
Epigastric Voice	-	-	-	0.001
Yes	3(%13)	20(%87)	23	
No	36(%65.5)	19(%34.5)	55	
Lung Sounds Right Upper Zone	-	-	-	< 0.001
Yes	39(%61.9)	25(%38.1)	63	
No	0(%0)	15(%100)	15	
Lung Sounds Right Lower Zone	-	-	-	< 0.001
Yes	39(%60.9)	25(%39.1)	64	
No	0(%0)	14(%100)	14	
Lung Sounds Left Upper Zone	-	-	-	< 0.001
Yes	36(%62.1)	22(%37.9)	59	
No	3(%15)	17(%85)	19	
Lung Sounds Left Lower Zone	-	-	-	0.001
Yes	36(%61.0)	23(%39)	23	
No	3(%15.8)	16(%84.2)	55	

Note: The *p*-value was obtained from Chi Square test. $p< 0.05$ is statistically significant.

Table 3. Availability of other methods based on ultrasonography.

Parameter	Value (%95 GA)
Fluctuation with Epigastric Compression for failure of ETE	-
Sensitive	%60 (%46,54 - %72,44)
Specificity	%83,33 (%58,58 - %96,42)
Positive Likelihood ratio	3,6 (1,26 - 10,32)
Negative Likelihood ratio	0,48 (0,33 - 0,7)
Positive Predictive Value	%92,31 (%80,71 - %97,18)
Negative Predictive Value	%38,46 (%30,1 - %47,56)
Epigastric Voice for failure of ETE	-
Sensitive	%65.45 (%51,42 - %77,76)
Specificity	%86,96 (%66,41 - %97,23)
Positive Likelihood ratio	5,02 (1,72 - 14,67)
Negative Likelihood ratio	0,4 (0,27 - 0,59)
Positive Predictive Value	%92,31 (%80,41 - %97,23)
Negative Predictive Value	%51,28 (%41,45 - %61,02)
Lung Sounds Right Upper Zone for success of ETE	-
Sensitive	%100 (%90,97 - %100)
Specificity	%38,46 (%23,36 - %55,38)
Positive Likelihood ratio	1,63 (1,27 - 2,09)
Negative Likelihood ratio	0
Positive Predictive Value	%61,9 (%55,91 - %67,56)
Negative Predictive Value	100%

(Table 3) contd.....

Parameter	Value (%95 GA)
Lung Sounds Right Lower Zone for success of ETE	-
Sensitive	%100 (%90,97 - %100)
Specificity	%35,9 (%21,2 - %52,82)
Positive Likelihood ratio	1,56 (1,23 - 1,97)
Negative Likelihood ratio	0
Positive Predictive Value	%60,94 (%55,23 - %66,36)
Negative Predictive Value	100%
Lung Sounds Left Upper Zone for success of ETE	-
Sensitive	%92,31 (%79,13 - %98,38)
Specificity	%43,59 (%27,81 - %60,38)
Positive Likelihood ratio	1,64 (1,23 - 2,19)
Negative Likelihood ratio	0,18 (0,06 - 0,57)
Positive Predictive Value	%62,07 (%55,04 - %68,63)
Negative Predictive Value	%85 (%64,34 - %94,68)
Lung Sounds Left Lower Zone for success of ETE	-
Sensitive	%92,31 (%79,13 - %98,38)
Specificity	%41,03 (%25,57 - %57,9)
Positive Likelihood ratio	1,57 (1,19 - 2,07)
Negative Likelihood ratio	0,19 (0,06 - 0,6)
Positive Predictive Value	%61,02 (%54,27 - %67,37)
Negative Predictive Value	%84,21 (%62,8 - %94,4)

PETCO2 measurement seems to be a confirmation method that can be easily applied both in and out of the hospital. However, exhaled carbon dioxide may be detected in cases, such as the presence of a tracheo-esophageal fistula, intubation with a cuffless tube (children), burst cuff, or hypopharyngeal positioning of the tube cuff [12]. In addition, it has been reported that in cases of pulmonary thrombo-embolism, sufficient carbon dioxide may not be exhaled and may give false negative results [6]. Therefore, esophageal intubation is associated with the absence of a typical square capnogram [12]. Esophageal intubation can be excluded if the capnogram has an increasing amplitude of at least 4-7.8,9,15 and a peak amplitude of at least 7.5 mmHg16 after the ETE procedure. Grmec *et al*. found that capnography had a specificity of 100% (97-100) and sensitivity of 100% (98-100) in confirming tracheal intubation in 246 cases in which ETE was performed outside the hospital [8]. Maskay *et al*. found that the sensitivity, specificity, positive predictive value, and negative predictive value of capnography in ETE confirmation were 96.43%, 100%, 100%, and 78.57%, respectively [15 - 17]. In his meta-analysis, Li identified 512 studies on capnography between 1966 and 1999 and analyzed 10 studies (published after 1990), including a total of 2,192 cases [18]. Sensitivity and specificity of capnography were found to be 93% and 97%, respectively. Silvestri *et al*. found that waveform capnography had 100% sensitivity (NPV 1.0, 95%CI 0.98-1.00) and 100% specificity (PPV 1.0, 95%CI 0.93-1.00) in ETE verification in their experimental study with cadavers [19]. PETCO2 measurement with capnography is considered to be the best method for in and out of the hospital because of its advantages, such as the widespread availability of portable measurement devices and lack of practitioner dependence.

It may be misleading to choose a single verification method for patients with ETE indications in and out of the hospital. Therefore, most clinicians tend to use conventional methods in addition to USG and PETCO2 measurement. Lung auscultation and monitoring of water vapor in the tube may cause false positives [6]. In this study, respiratory sounds were heard from both hemithoraces in more than half of the failed ETE applications. This shows that lung auscultation may mislead the practitioner at a high rate. It has been known for a long time that only lung auscultation may be misleading, and therefore, epigastric auscultation should also be performed [20]. Epigastric auscultation and fluctuations in epigastric compression were observed in only 3 (7.7%) successful cases. The study by Grmec conducted among cardiac arrest and non-cardiac arrest patients contains interesting data. According to this study, auscultation (lung and epigastric) did not seem to be better than capnography in cardiac arrest patients, but its sensitivity was 100%, and specificity was 80%. In non-cardiac arrest patients, the sensitivity of auscultation decreased to 94% and specificity to 83% [8]. In another study by Grmec and Mally, the sensitivity of auscultation was 94% and specificity was 66% [21]. In this study, the specificity of lung auscultation was 43.59-35.9%, and the sensitivity was 100-92.31%, while the specificity of epigastric auscultation was 86.96% and the sensitivity was 65.45%. However, fluctuation with epigastric compression and epigastric auscultation alone showed >80% specificity. No method has 100% accuracy to confirm ETE [22]. The lower sensitivity and specificity compared to previous studies may be due to the more frequent use of methods, such as USG and PETCO2, which have emerged due to technological developments in recent years, and less reflection of examination methods in clinical practice other than educational activities. USG is used as the gold standard confirmation method in many clinical studies [23, 24]. This study may give you the feeling of living in the past. However, considering the reduced availability of technological infrastructure, especially in disasters, in rural areas far away from urban centers, and in low-income countries, keeping examination-based methods on the agenda will make clinicians feel safer in such environments.

4.1. Limitation

Not having enough air or fluid in the stomach can be a disadvantage for the procedure. As with most observational data acquisition methods, it can be subject-dependent. In addition, variations in gastric content may prevent fluctuation monitoring. It is recommended not to prolong the procedure for more than 5 seconds to avoid interruption of chest compressions. The risk of gastric regurgitation and aspiration should be kept in mind in esophageal intubations or in patients who were previously over-ventilated with a balloon-valve mask. The fact that the experience of the clinician performing the application was not homogeneous might have affected the results. The inclusion of only 78 patients from a single center limits the generalizability of the findings to other populations or healthcare settings. It will increase the power of a more comprehensive and multicenter repeat study.

CONCLUSION

This study highlights the limitations of relying solely on traditional methods like lung sound auscultation for ETE placement verification. Although the fluctuation that occurs in the tube with epigastric compression is not as sensitive and specific as USG, it is a better method than lung auscultation. It should be considered as an additional tool, particularly in situations where technological infrastructure is unavailable. While the absence of right lung sounds strongly suggests incorrect placement, the presence of lung sounds, even bilaterally, does not provide sufficient assurance of correct tracheal intubation due to low specificity. Epigastric auscultation and fluctuation, while more specific for failure, also have limited sensitivity. Further research may be warranted to investigate the utility of combining these bedside methods with other point-of-care diagnostics to improve the accuracy of ETE placement confirmation.

AUTHORS' CONTRIBUTIONS

The authors confirm their contribution to the paper as follows: M.B. and C.K.: Contributed to conception; A.K.K., K.S., and M.B.: Contributed to design; M.B. and Ö.K.: Contributed to supervision; C.K., K.S., A.K.K., T.A., and E.E.: Contributed to data collection and processing; K.S.: Contributed to analysis and interpretation; C.K. and M.B.: Contributed to literature review; T.A., A.K.K., and M.B.: Contributed to writing; T.A. and M.B.: Contributed to critical review.

LIST OF ABBREVIATIONS

SD	=	Standard Deviation
ETI	=	Endotracheal Intubation
USG	=	Ultrasonography

ETHICAL STATEMENT

Ethics committee approval was obtained from the ethics committee of Düzce University, Turkey (Date: 18.01.2021; Decision number: 2021/05)

HUMAN AND ANIMAL RIGHTS

All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from each participant/relative.

STANDARDS OF REPORTING

CONSORT guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data and supportive information are available within the article.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Declared none.

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