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Is heimlich maneuver safe? A literature review and case report

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Abstract

The Heimlich Maneuver (HM) is one of the main techniques approved by the American Red Cross and the American Heart Association, which has saved the lives of many choking victims. However, several studies have shown that this maneuver is associated with serious complications such as abdominal aortic thrombosis, Gastric and Esophageal rupture. In this study we report an 83-year-old female patient with a history of dysphagia on whom the HM was performed for witnessed aspiration by a family member during lunch. We also review the available reports of HM complications from inception to 2024 and discuss some other reported solutions that could be used instead of this maneuver to reduce its complications.

Keywords: Heimlich maneuver; Abdominal thrust; Aortic aneurysm thrombosis; Case report; Gastric rupture.

Introduction

Heimlich Maneuver (HM) or abdominal thrust is one of the most common therapies used by physicians, nurses, and even the public, which is performed in acute upper airway obstruction. This technique is used among children and adults with eating disorders [1,2] or in case of choking on a substance, and in many of these cases, it has decreased mortality. But since 1975, when this method was described by Heimlich and accepted by the American Heart Association and American Red Cross (ARC) [3], significant reports have shown that HM can have serious complications such as Pneumothorax, Abdominal aortic thrombosis, Gastric or Pancreatic rupture, etc. that has led to the death of some cases. Here we report an 83-year-old female patient with a history of dysphagia on whom the HM was performed for witnessed aspiration by a family member during lunch. We also take this opportunity to review the available reports of HM complications from inception to 2024 represent them in a Table and discuss the other reported solutions that could be used instead of this maneuver to reduce its complications.

Material and methods

A literature search in PubMed was conducted based on "Heimlich maneuver", and "case reports" as keywords, which showed 64 case reports from 1975 to 1.1.2024. Finally, by investigating and adding relevant references from some review studies, 46 considerable cases were documented in the Table.

Case presentation

An 83-year-old female patient developed dyspnea after choking on her food. Her grandson, who was a physician performed HM on her and it successfully dislodged the airway obstruction. She did not develop any evidence of confusion but for further assessments was transported to the emergency room of our hospital. On arrival, the patient's vital signs were stable, and she had no history of previous illnesses except long-standing dysphagia and epigastric pain on swallowing. Because she complained of shortness of breath, computed tomography was obtained (Figure 1), and it revealed a mild reticular change at the bases of the lungs and a large aneurysm at the entrance of the thoracic to the abdominal aorta. The patient was hospi-

talized with the diagnosis of aspiration pneumonia and treated with IV Ceftriaxone plus Clindamycin and was discharged after 3 days. Two weeks later, the patient returned due to a decreased level of consciousness and increasing shortness of breath and was hospitalized and treated again with the diagnosis of pneumonia. Also, a pulmonary CT-angiography was performed which was negative for pulmonary thromboembolism. In both hospitalizations, due to an aortic aneurysm, it was recommended not to undergo HM in case of recurrent aspiration.

Table 1: Reported complications associated with Heimlich maneuver.

Type of complication	Age	Gender	Choking on	Performer	Complain or sign (s) after HM	History	Outcome	Final status	Year (Ref)
Gastric Rupture	74	M	Food	Alert Companion	Abdominal Distention	Unknown	Laparotomy / splenectomy / 12 days hospitalization	Discharged in good condition	1975 [10]
	39	M	Food	Food Service Employee	None	CP / organic brain syndrome / epilepsy / DM	None	Died	1983 [11]
	74	M	Meat	Family Members	Abdominal Discomfort	Parkinson's disease	Laparotomy	Survived	1987 [12]
	76	F	Food	Nurse	AP Radiated to Left Shoulder	MDD	Laparotomy / ICU admission / Ventilation after bronchopneumonia	Died	[13]
	93	M	Food	Untrained But Well-Meaning Bystanders	Abdominal Distention	Unknown	Laparotomy / 66 days hospitalization	Survived	1993 [14]
	Unknown	Unknown	Unknown	Unknown	Pulmonary & Abdominal Symptoms	Unknown	Laparotomy	Died	1996 [15]
	Unknown	Unknown	Unknown	Unknown	Pulmonary & Abdominal Symptoms	Unknown	Laparotomy	Discharged with good condition	1996 [15]
	57	F	Pizza	Unknown	Vomited Blood	Unknown	Laparotomy / myocardial infarction / bronchopneumonia / 16 days hospitalization	Died	1998 [16]
	74	F	Meat	Bystander	AP & Distention	Unknown	Laparotomy	Discharged without any complications	2002 [17]
	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Laparoscopic surgery	Discharged without any complications	2003 [18]
	59	F	Unknown	EMT	Unknown	Nasopharyngeal cancer	Unsuccessful HM / CPR & endotracheal intubation / laparotomy	Survived	2012 [19]
Abdominal Aortic Thrombosis	62	M	Chicken	Patients' Wife	Agonizing Pain & Weakness of The Lower Extremities	no history of atherosclerotic disease or clotting disorder	acute RF/ perforated ischemic colon	Died after operation	1983 [20]
	69	M	Meat	Untrained Companion	Unable to Move his Legs	AA	Laparotomy / ICU admission / massive complications of revascularization-reperfusion syndrome	Died	1985 [21]
	70	M	Meat	Female Patron	Numbness & Paralysis of both Legs	CABG / renal insufficiency / popliteal bypass-graft	Fasciotomies after unsuccessful embolectomy & instillation of urokinase / amputation / 4 weeks hospitalization	Discharged with RF	2002 [22]
	80	F	Prune	Unknown	Abdominal Discomfort	AAA	Massive systemic reperfusion injury after operation	Died	2002 [23]

	84	M	Food	Home Nursery	Femoral Pulse Was Absent / Mottling of The Foot	Unknown	Massive ischemia-reperfusion injury & RF after operation	Died	2002 [23]
	63	M	Food	Bystander	Mild Abdominal Discomfort	Infrarenal AAA	type I, endoleak / aortic stent-graft displacement	Survived	2003 [24]
	81	M	Unknown	Unknown	LBP/ LoS & Absent Pulses in The Lower Extremities	COPD / lower extremity DVT/ HTN / infra-renal AAA / left hip replacement	Mechanical ventilation	Died after multiorgan system failure	2007 [25]
	78	F	Food	Nurse	Respiratory Arrest	Schizophrenia / hypothyroidism	Laparotomy	Died	2008 [26]
Aortic Valve Rupture / Aortic Dissection	86	M	Food	Untrained Companion	Severe SoB	Mild aortic insufficiency	Refused any invasive procedure	Survived but 3 weeks later died	1983 [27]
	74	F	Unknown	Unknown	Unknown	Aortic valve prosthesis	None	Survived	1987 [28]
	85	M	Bread	Unknown	Unconscious	Alzheimer-type dementia / HTN / hypercholesterolemia	Revealed in autopsy	Died	2018 [29]
	67	M	Meat	Emergency Medical Technician	Left-Sided Hemiplegia	None	Thrombolytic therapy / TPA injection / surgical repair	Discharged without complications	2019 [30]
Pneumomediastinum / Pneumothorax	10	M	Water	Unknown	Vomiting	Epilepsy	CPR / intubation / bacteremia	Discharged in vegetative state and died 7 years later	1987 [31]
	3	M	Thought To Be a Toy	Patients' Father	"Funny" Sensation in The Back of Throat	None	Gastrografin swallow / esophagoscopy / bronchoscopy / foreign body had not been recovered	Discharged after 24 hours observation	1989 [32]
	7	M	Pen	Patients' Mother / Physician	Retrosternal Chest Pain	None	Topical & general anesthesia/ nasoendoscopy/	Discharged with unremarkable recovery	1998 [33]
	45	F	Bony Chicken Meat	Caretaker nurse	Emphysema	Mental illness	Pharyngoesophagoscopy	Survived	2015 [34]
Esophageal Rupture	61	F	Meat	Patients' Husband	Dyspnea & Severe Pain in LUQ Radiated to Left Shoulder	None	Gastrografin swallow / Surgery / CPR / ventilation / 83 days hospitalization	Survived	1984 [35]
	62	M	Food	Patients' Nephew	Chest Pain & Respiratory Distress	Unknown	Surgery / 16 days hospitalization	Survived	1986 [36]
	26	M	Unknown	Unknown	Neck Swelling & Dyspnea,	None	None	Survived	1996 [37]
	16	M	Rice	Patients' Mother	Throat Pain, Odynophagia, Secretion Intolerance, Muffled Voice & Neck Stiffness	None	Transcervical incision	Discharged in good condition	2018 [38]
Diaphragmatic Rupture / Hernia	±60	M	Unknown	Unknown	Unknown	Mental Illness	None	Died	1984 [39]
	10	F	Mucus Plug	Patients' Sister	Upper AP & Vomiting	Unknown	Laparotomy	Survived	2013 [40]
	85	F	Food	Nurse	Dyspnea And Dysphagia	Unknown	Laparotomy / septic shock / 50 days hospitalization	Discharged with slowly recovering	2018 [41]

	85	F	Medical Staff	Piece of Meat	Dyspnea & Pleuritic Chest Pain	Unknown	Laparotomy	Survived	2018 [42]
Hepatic Rupture	88	M	Unknown	Piece of Meat	AP	Unknown	Medical therapy	Survived	2007 [43]
	84	M	Bystand-er	Unknown	None	Unknown	Unsuccessful HM, CRP, Intubation, bronchoscopy	Survived	2015 [44]
Pancreatic Transection	11	M	Nothing	Patients' Father	Severe Upper AP	None	Laparotomy with distal pancreatectomy and splenic salvage	Discharged in good condition	2007 [45]
	3	M	Unknown	Piece of Cantaloupe	AP, Weight Loss	None	None	Survived	2009 [46]
Mesenteric Laceration	76	M	Aspirin	Patients' Son	Abdominal & Leg Pain & Dyspnea	Unknown	None	Died	1986 [47]
Jejunum Rupture	22	M	Wood	Alert Atten-dant	Persistent Vomiting	Mental Illness	Laparotomy	Survived	1986 [48]
Splenic Rupture	83	M	Meat	Nurse	Unconscious & collapsed	Unknown	CPR	Died	2011 [49]
Cholesterol Embolization & Arterial Occlusion	56	F	Meat	Bystander	Right Foot Pain	Unknown	CT Angiography / Heparin infusion	Discharged with Apixaban as oral treatment	2021 [50]
Myocardial Injury	53	M	Noodle	Security Guard	Upper Abdominal Discomfort	HTN	Cardiac Arrest	Died	2022 [51]
Rotator Cuff Tear	48	M	Unknown	Fellow Restaurant Diner	Shoulder Pain	Unknown	Arthroscopy / Uneventful Recovery	Survived	2010 [52]
Thoracic Vertebral Compression Fractures	80	F	Unknown	Untrained Person	LBP With Muscle Spasm	Osteoporotic Thoracic Vertebral Fractures	Kyphoplasty	Survived	2010 [53]

Male: M; Female: F; Low Back Pain: LBP; Loss of Sensation: LoS; Cerebral Palsy: CP; Aortic Aneurysm: AA; Abdominal Aortic Aneurysm: AAA; Coronary Artery Bypass Graft: CABG; Renal Failure: RF; Diabetes Mellites: DM; Deep Venous Thrombosis: DVT; Tissue Plasminogen Activator: TPA; Emergency Medical Technician: EMT; Shortness of Breath: SoB; Left Upper Quadrant: LUQ; AP: AP; Major Depressive Disorder: MDD; Cardiopulmonary Resuscitation: CPR; Heimlich Maneuver: HM; Intensive Care Unit: ICU; Hypertension: HTN.

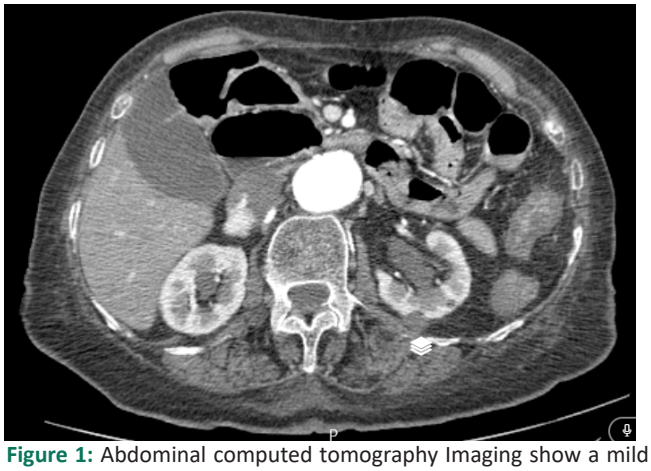

Figure 1: Abdominal computed tomography Imaging show a mild reticular change at the bases of the lungs and a large aneurysm at the entrance of the thoracic to the abdominal aorta.

Discussion

HM has saved the lives of many choking victims [4], but significant cases of post-HM complications have been published so far. The experience and level of training of the person performing HM, the number of times HM is performed, the presence of comorbidity in the victim, and age have a significant role in the occurrence of these complications. In this section, we give a review of each of the complications listed in the Table, and at the end, we discuss the proposed solutions that can be used to prevent them.

1- Gastric rupture (11 cases)

2- Abdominal aortic thrombosis (8 cases)

3- Aortic Valve Rupture / Aortic Dissection (4 cases)

4- Pneumomediastinum / Pneumothorax (4 cases)

5- Esophageal rupture (4 cases)

6- Diaphragmatic Rupture / Hernia (4 cases)

7- Hepatic Rupture (2 cases)

8- Pancreatic Transection (2 cases)

9- Other complications such as mesenteric laceration, jejunum rupture, splenic rupture, cholesterol embolization and arterial occlusion, myocardial injury, rotator cuff tear, and thoracic vertebral fractures (once each).

As shown in the Table 1, many of the HM performers did not have enough experience and training in this area and were among the bystanders present at the accident site. Ichikawa [5] showed that consecutive HMs can be associated with complications, and supine and prone positions are more efficient

than standing. Comorbidity also played a role in the occurrence of some complications, for instance, several patients with abdominal aortic thrombosis had aortic aneurysm, a patient with myocardial injury had hypertension and a patient with thoracic vertebral fracture had osteoporosis. Also, in some patients with neuropsychiatric disorders such as cerebral palsy, dementia, and schizophrenia, the lack of proper evacuation of the foreign body after HM leads to consecutive HMs and, as a result, can increase the possibility of complications. Also, most of the patients who developed complications after HM were adults and were over 60 years old. Various techniques such as back blows, chest thrusts/compressions, and manual removal of obstructions from the mouth are recommended by ARC other than HM [6]. To the best of our knowledge, both the Red Cross and the National Health Service (NHS) have recommended HM to be performed as the third step in the approach to choking victims, so that in the first step, the victim should be encouraged to evacuate the foreign body by coughing, and in the second step, 5 strong blows should be given between the scapulas of the victim, if these two steps failed, then HM should be performed [7]. In 2016 the Australian and New Zealand Committee on Resuscitation (ANZCOR) recommended back blows and chest thrusts instead of HM [8]. Another technique is the Table Maneuver which was introduced by Blain et al. in 2010 [9], in which the choking victim lies on the table with his face and hands hanging from it, and the performer gives sharp blows between the scapulas with the heel of the hand. This technique can be performed on all age groups and patients in cases where there is more doubt that HM is associated with complications.

Conclusion

Especially in elderly patients, those who have underlying diseases such as aortic aneurysms or clotting disorders, and patients with neuropsychiatric illnesses such as cerebral palsy or dementia, the HM should be performed correctly and not with too much pressure to the abdomen to reduce the risk of complications and even without complaints, this group of patients should subsequently be transferred to the hospital so that further assessments can be performed in a shorter time if there are any complications. It is also recommended that all patients undergoing HM should immediately be taken to the hospital if they have complaints such as abdominal distention or discomfort, dyspnea, chest pain or neck stiffness, foot pain, and pulseless or paralytic lower extremities after HM has been performed.

Patient consent: An informed consent was taken from the patient's family for the publication of this case report.

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