

# CARDIAC COMPLICATIONS IN THE FIRST WEEK POST TRANSHIATAL ESOPHAGECTOMY FOR ESOPHAGEAL CANCER

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## ABSTRACT

**Objective:** To determine cardiac complications and associated risk factors in the first week post transhiatal esophagectomy for esophageal cancer patients without detectable cardiac diseases.

**Methods:** This descriptive study was conducted during the period from January 2000 through October 2007. Sixty-eight patients were included in this study. Patients with pre existing cardiac diseases were excluded. All the patients underwent transhiatal esophagectomy for a malignant lesion. All the cardiac complications were documented and analysed in the first week post operatively.

**Results:** There were 50 males (73.5%) and 18 females (26.5%), age ranged from 35 to 83 years (mean 62.7 ± 10.3). Post operative cardiac complications occurred in 25 patients (36.8%) during the first post operative week. Atrial fibrillation was the most commonly reported cardiac complication which occurred in 14 patients (20.6%), followed by supra ventricular tachycardia in six patients (8.8%), two patients developed atrial flutter (2.9%), fatal myocardial infarction in two patients (2.9%) and nonfatal myocardial infarction in one (1.5%). Male gender, older age, longer procedure and first 48 hours post transhiatal esophagectomy were risk factors.

**Conclusion:** Cardiac complications, mainly arrhythmias, are common after transhiatal esophagectomy. Preoperative evaluation, intraoperative and postoperative cardiac monitoring are mandatory in all patients even in those who have no cardiac illnesses.

**Key words:** Cardiac Complications, Esophagectomy, Transhiatal

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## Introduction

Worldwide, esophageal cancer is the sixth most common cause of cancer-related death,<sup>(1)</sup> though, according to the WHO global InfoBase online reports of the year 2005, it ranks as the tenth cause of cancer-related death in Jordan. Curative resection remains the cornerstone of therapy.<sup>(1,2)</sup> Various

operative procedures for esophageal carcinoma include transthoracic approach, transhiatal approach, or thoracoscopic dissection of the esophagus combined with abdominal mobilization of the stomach.<sup>(3,4)</sup> The operative approach is dictated by the location of the tumor, and, to a degree, one of personal preference.<sup>(5-7)</sup> Transhiatal esophagectomy

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was originally described by Denk in 1913 but did not become an accepted modality of therapy for esophageal carcinoma until popularized by Orringer *et al.* in 1978.<sup>(2,8)</sup> The transhiatal approach although less traumatic than the transthoracic approach, may present a few potential problems for the anesthesiologist and the surgeon in the form of hemodynamic disturbances like hypotension and arrhythmias due to mechanical compression of the heart during blunt finger dissection of the esophagus from the posterior mediastinum.<sup>(3)</sup> In this study we retrospectively studied the cardiac complications in the first week post transhiatal esophagectomy for esophageal cancer at King Hussein Medical Centre (KHMC).

## Methods

This descriptive study was conducted at KHMC in the period from January 2000 through October 2007 at the thoracic surgery division. The study included 68 patients all of whom were diagnosed to have oesophageal malignancy by upper endoscopy and histopathological biopsy confirmation. Data were collected retrospectively from the medical records. Patients with pre existing cardiac diseases and arrhythmias were excluded. Chest and upper abdominal CT scan were performed for all the patients to rule out metastatic lesions, while brain MRI and bone isotope scan were performed only if the patient was symptomatic. Preoperative evaluation included complete blood count, coagulation profile, kidney function test, liver function test, total protein and albumin to assess the nutritional status of the patient, pulmonary function test and arterial blood gases. Total parenteral nutrition was started preoperatively if needed. All the patients were evaluated by a cardiologist prior to surgery. Cardiac evaluation included history of risk factors and any prior cardiac illness, physical examination, chest X-ray, electrocardiogram (ECG) and a two dimensional echocardiography. General endotracheal anaesthesia using single lumen tube as the anaesthetic method was used for all the patients. Subclavian catheter, radial arterial line, peripheral intravenous line and urinary catheter were inserted prior to surgery. All the patients were placed in a supine position with the neck tilted to the right side. Midline abdominal incision was done to access the abdomen in order to perform the gastric mobilization then transhiatal dissection using finger

blunt dissection technique was done to mobilize the oesophagus and after that a longitudinal Para sternochledomastoid incision was done to access the cervical part of the esophagus followed by an esophageogastric anastomosis.

Intraoperative cardiac monitoring of the heart rate, rhythm and blood pressure was done during transhiatal mobilization of the oesophagus. All the patients were admitted to the intensive care unit postoperatively, at which continuous monitoring of heart rate, rhythm, blood pressure, central venous pressure and oxygen saturation was done. Electrolytes, including potassium, were measured twice daily and were corrected accordingly. Fluid regimens and the need for blood transfusion were managed strictly by the thoracic surgeons and the intensivists to avoid any mistakes regarding this issue. An ECG was performed if any arrhythmias occurred and a print out of any event from the monitor was taken. Cardiac complications during the first week postoperatively were recorded and treated accordingly by a cardiologist. Stats direct statistical software version 2.6.5 was used to perform the statistical analysis. The student's t test was used for the statistical study. Continuous variables were expressed as the mean  $\pm$  the standard deviation, categorical variables were expressed as percentages. The level of confidence was defined as a P value of less than 0.05.

## Results

There were 50 males (73.5%) and 18 females (26.5%), their age ranged from 35 to 83 years (mean  $62.7 \pm 10.3$ ). Preoperative heart rate, blood pressure, potassium levels are shown in Table I.

**Table I.** Preoperative heart rate, blood pressure and electrolytes measurements

Recorded data	Value*
Heart rate	79.9 $\pm$ 12.3
Systolic blood pressure (mm Hg)	118.2 $\pm$ 19.7
Diastolic blood pressure (mm Hg)	66 $\pm$ 10.2
Potassium (mEq/L)	4.1 $\pm$ 0.2

\* mean  $\pm$  standard deviation

Duration of surgery ranged from two to five hours (mean  $3.5 \pm 0.7$  hours). During mediastinal manipulation 47 patients (69.1%), developed transient arrhythmias and hypotension. Out of these 47 patients, 19 patients developed post operative arrhythmias (40.4%). Post operative cardiac

complications occurred in 25 patients (36.8%) during the first post operative week. Atrial fibrillation was the most common reported cardiac complication which occurred in 14 patients (20.6%), followed by supraventricular tachycardia in six patients (8.8%), myocardial infarction in three patients (4.4%), and two patients developed atrial flutter (2.9%). Cardiac complications were more common in the males ( $p=0.0430$ ) (Table II), and 23 patients (33.8%) of these were above 60 years of age ( $p= 0.0303$ ), peaking at the 8<sup>th</sup> decade (Table III).

**Table II.** Relationship of gender to cardiac complications post transhiatal esophagectomy

Sex	AF*	SVT**	MI‡	AFL†	Total	%
Male	11	4	2	2	19	28.0
Female	3	2	1	·	6	8.8
Total	14	6	3	2	25	36.8

\*Atrial fibrillation; \*\*Supra ventricular tachycardia; ‡Myocardial infarction; †Atrial flutter

**Table III.** Relationship of age to cardiac complications post transhiatal esophagectomy

Age	AF*	SVT**	MI‡	AFL†	Total	%
30-39	0	0	0	0	0	0
40-49	1	0	0	0	1	1.5
50-59	0	1	0	0	1	1.5
60-69	3	1	0	0	4	5.9
70-79	7	3	2	1	13	19.1
80-89	3	1	1	1	6	8.8
Total	14	6	3	2	25	36.8

\*Atrial fibrillation; \*\* Supra ventricular tachycardia; ‡ Myocardial infarction; † Atrial flutter

Surgeries that needed more than three hours to be completed were associated with a higher rate of cardiac complications ( $p= 0.0094$ ) (Table IV).

**Table IV.** Relationship of surgery duration to cardiac complications post transhiatal esophagectomy

Duration of surgery	AF*	SVT**	MI‡	AFL†	Total	%
2-3 (Hours)	2	0	1	0	3	4.4
3-4 (Hours)	4	1	0	1	7	10.3
4-5 (Hours)	8	5	2	1	15	22.1
Total	14	6	3	2	25	36.8

\* Atrial fibrillation; \*\* Supra ventricular tachycardia; ‡ Myocardial infarction; † Atrial flutter

The first 48 hours postoperatively were associated with a higher rate of cardiac complications when

compared to the rest of the week ( $p=0.0293$ ), peaking at the second postoperative day (Table V).

**Table V.** Relation of postoperative day to cardiac complications post transhiatal esophagectomy

Postoperative day	AF*	SVT**	MI‡	AFL†	Total	%
First	4	2	0	1	7	10.2
Second	8	3	1	1	13	19.1
Third	1	1	0	0	2	3.0
Forth	1	0	1	0	2	3.0
Fifth	0	0	0	0	0	0
Sixth	0	0	0	0	0	0
Seventh	0	0	1	0	1	1.5
Total	14	6	3	2	25	36.8

\*Atrial fibrillation; \*\*Supra ventricular tachycardia; ‡Myocardial infarction; †Atrial flutter

Out of the 14 patients who developed atrial fibrillation seven patients reverted to normal sinus rhythm spontaneously, though the rest of the patients received Amiodarone infusion for 24 hours (300 mg loading dose over 30 minutes then maintenance dose according to body weight ranging from 700 mg to 900 mg intravenous infusion over 24 hours) four of whom reverted to normal sinus rhythm in the first 24 hours, while one patient required cardioversion. The other two patients developed permanent atrial fibrillation and their heart rate was controlled with beta and calcium channel blockers and were anticoagulated with Warfarin. Patients who developed supraventricular tachycardia were reverted to normal sinus rhythm by Adenosine and Verapamil. Patients with atrial flutter reverted spontaneously to normal sinus rhythm after few hours. Three patients developed acute myocardial infarction; two of them were complicated by a cardiogenic shock and died several hours later. The third patient, aged 83 years, developed inferior myocardial infarction, and remained stable on conservative medical therapy.

## Discussion

Surgical resection of carcinoma of the esophagus is arguably one of the most morbid thoracic operations. Atrial fibrillation and other types of arrhythmias frequently complicate recovery from esophagectomy, and its significance remains unclear,<sup>(9)</sup> so preoperative risk assessments is an important aspect of patient selection for esophagectomy.<sup>(10,11)</sup> In transhiatal esophagectomy, blind finger dissection of the esophagus in the

mediastinum is done, during which, the surgeon's hand is dissecting bluntly around the esophagus and inevitably compresses the atria and distorts the heart, causing profound arterial hypotension and arrhythmias.<sup>(3,9,12)</sup> Vagal stimulation and manual contact with the pericardium may also contribute to arrhythmias.<sup>(3,9)</sup> In our series we studied the cardiac complications in the first week post transhiatal esophagectomy, and our results showed that arrhythmias are the most common cardiac complication during this period, which is comparable to many studies in this field.<sup>(3,9,13-15)</sup> Atrial fibrillation was the most common reported arrhythmia post operatively reaching 20.6% in our series, although comparable to the results of Ma *et al.* and Jorgensen *et al.*,<sup>(13,15)</sup> our results differ from what is reported by Malhotra *et al.*,<sup>(3)</sup> who documented that most of the arrhythmias occurred during the mediastinal dissection process and these are transient and only two patients out of 20 developed arrhythmias in the postoperative period in the form of supraventricular arrhythmias, the incidence of which according to his study was statistically insignificant. The size of Malhotra's sample (n=20) could explain the discrepancy between his results and ours. The incidence of cardiac complications were more in males, above 60 years of age with statistically significant results, and this is comparable to the results of Ma *et al.* and Murthy *et al.*<sup>(9,15)</sup> Postoperative cardiac complications related directly to the duration of surgery, the longer the duration of surgery, particularly the mediastinal manipulation process, the higher the incidence of cardiac complications postoperatively, which is comparable to the results reported with many other authors.<sup>(3,15,16)</sup> Most of the cardiac complications occurred in the first 48 hours with a peak occurring on the second postoperative day. This is an agreement with Chin *et al.* who reported that 87% of the arrhythmias appeared in the first 24 hours postoperatively.<sup>(14)</sup> We didn't report any complications on the fifth and sixth postoperative days, and only one complication was reported at the seventh postoperative day. Cardiac monitoring during the first four postoperative days only could be more cost effective than for the whole week postoperatively. The most fatal cardiac complication was acute myocardial infarction which occurred in three patients (4.4%). None of these patients had cardiac symptoms preoperatively and carried no risk factors for coronary artery disease

apart from age and gender, so we didn't find any indication to perform further cardiac evaluation such as stress echocardiography or treadmill. One of the largest studies to date, comparing the outcomes of transhiatal versus transthoracic esophagectomy in 17,395 patients, reported by Connors *et al.* in the year 2007, showed that the incidence of cardiac complications were higher in transhiatal approach in comparison with transthoracic approach, but the difference was not statistically significant.<sup>(12)</sup> In conclusion cardiac complications, mainly arrhythmias, are common after transhiatal esophagectomy even in patients with no known cardiac illness, and this is mainly due to the mechanical manipulation of the heart during esophageal dissection. Male gender, age more than 65 years, longer procedure duration and the first 48 hours postoperatively are risk factors. Preoperative cardiac evaluation, intraoperative and postoperative cardiac monitoring are mandatory in these patients.

### Limitations of the study

National studies to be compared with our results were not available after making the suitable search.

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