

Indications and Types of Thoracic Incisions in Al-Ramadi City

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Abstract.

Background: Thoracotomy incision was done in Ramadi City and it is not uncommon surgical procedure.

Objectives: Descriptive study for the indications for thoracotomy and the type of surgical incision .

Materials & Methods: A descriptive study was carried out on 130 consecutive patients who underwent thoracotomy for a time period between June 2007-June 2010 the whole work was done in Ramadi Teaching Hospital and Private hospital.

Results:-The age of incidence was ranged from one day to seventy six years old. Male to female ratio was equal.

Thoracotomy indications in childhood age group were commonly due to congenital malformation (Tracheo-esophageal fistula, diaphragmatic hernia and cong. Lobar emphysema).

In adulthood :-Hydatid cysts of the lung, mixed H.C of the right lung and right liver lobe or H.C of the posterior segment of the liver had higher percentage of indications in addition to early stages of bronchogenic tumors if those cases detected early and they are fit for surgery .

Regarding the type of thoracotomy incision, postero-lateral thoracotomy at the fifth intercostal space without rib resection was the most popular type of incision. Median sternotomy was used for cardiac injury and thymectomy procedures.

Thoracotomy can be used in some cases of the H.C liver and (mixed H.C right lung and posterior segment of the right lobe of the liver)without the need for thoraco-abdominal incision.

Conclusions & Recommendations: Thoracotomy is not uncommon procedure in Al-Ramadi Teaching Hospital it is regularly done for both emergency and elective indications.

1-There are many types of thoracotomy incisions and the classical postero-lateral thoracotomy is the most common type. the procedure can be indicated in cases of emergency and elective manner, thoracic and extra-thoracic conditions.

2-Congenital malformations of the esophagus(T.E.F),diaphragmatic hernia and lobar emphysema are major indications of thoracotomy in childhood.

3-Hydatid cysts of the lungs, posterior liver and right lung or hydatid cyst of the posterior liver are common indications of thoracotomy in adult age group.

4-old age group can tolerate the procedure and good results can be obtained if careful patient selection and preparation.

Key words : Thoracotomy, Incisions ,Saad , Al-Anbar, Iraq .

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Introduction:

Thoracic surgery is the field of medicine involved in the surgical treatment of diseases affecting organs inside the chest. Generally treatment of conditions of the lungs, chest wall components, and the diaphragm⁽¹⁾.

Thoracic surgery due to its deep relation in the field of the work is often grouped with heart surgery and called cardiothoracic surgery⁽²⁾.

Indications of thoracotomy:-

There are variable Indications of thoracotomy either pulmonary or thoracic non-pulmonary and sometimes abdominal conditions^(3,4,5,6,7,8):-

- Remove of thoracic tumors either pulmonary(brochogenic carcinoma) or extra pulmonary tumors.
- Treat injuries that cause lung tissue to collapse makes the lung able to re-expands(pleural thickening).
- Treat permanently collapsed lung tissue (atelectasis)
- Remove lung tissue that is diseased or damaged from emphysema or destructed lung parts.
- Remove blood or blood clots.
- Remove tumors, such as solitary pulmonary nodule or secondary lung metastasis.
- Extra-pulmonary indications according to extra-pulmonary intra-thoracic conditions like cardiac conditions(closed mitral valvotomy, patent ductus arteriosus closure).
- Esophageal conditions wither surgical resection of partial or total length of esophagus or modified Heller's esophageal myotomy.
- Surgery of thoracic major blood vessels whatever the cause such as trauma, aneurysm or congenital arterio-venous malformation.
- Mediastinal conditions for removal of masses, cysts and thymectomy

- Miscellaneous indication like dumbbell tumors of the vertebral column.

Thoracic incisions

There are many different approaches to thoracotomy. The most common modalities of thoracotomy are the following^(2,3,5,6,7,8).

1-Median sternotomy:- provides wide access to the mediastinum and is the incision of choice for most open-heart surgery and access to the anterior Mediastinal structures.

2-Posterolateral thoracotomy:- is a very common approach for operations on the lungs or posterior mediastinal structures , including the esophagus. When performed over the 5th intercostal space, it allows optimal access to the pulmonary hilum and therefore is considered the approach of choice for pulmonary resection both lung (pneumonectomy)and lobe(lobectomy).

3-Anterolateral thoracotomy:- is performed upon the anterior chest wall, left anterolateral thoracotomy is the incision of choice for open chest massage, a critical maneuver in the management of traumatic heart arrest. Anterolateral thoracotomy, like most surgical incisions, requires the use of tissue retractors.

4-Bilateral anterolateral thoracotomy combined with transverse sternotomy results in the "**clamshell**" **incision**, the largest incision commonly used in thoracic surgery.

5-Axillary Thoracotomy:-The Axillary thoracotomy was originally developed for operations on the upper thoracic sympathetic nerve system. It was modified for first rib resection for thoracic outlet syndromes.

6-Anterior Thoracotomy:The anterior thoracotomy has the distinct advantage of allowing the patient to remain supine, with a resulting improvement in cardiopulmonary function. It has been used with decreasing frequency because of improvement of anesthetic techniques and management, the option of median sternotomy, the development of mediastinal staging procedures

7-TRANSVERSE

THORACOSTERNOTOMY:

Cooper (1991) and Pasque and associates (1990) re-described the transverse thoraco sternotomy, and many refer to it now as the clamshell or crossbow incision. Its primary role in recent years has been for bilateral lung transplantation. I, however, recommend it as an alternative to median sternotomy for bilateral general thoracic surgical procedures, such as the resection of bilateral metastatic lesions to the lungs and bilateral simultaneous treatment of spontaneous pneumothorax.

8-THORACOABDOMINAL

INCISION:-The thoraco-abdominal incision provides extended exposure, particularly for operations in the lower thorax and upper abdomen. It has been used less frequently in the past and has been maligned more by hearsay perhaps than by actual fact. It can be particularly useful for difficult operations involving the lower esophagus

9-right or left lower thoracotomy with trans diaphragmatic approach:- to deal with liver or esophagus and stomach respectively.

10-Posterior thoracotomy:-J or reverse J which is less commonly used.

11-multiple incisions:-as in thoracoscopy at the line of classical thoracotomy.

12-posterior thoracotomy incision.

After completion of the surgical procedure one or more chest tube drains connected to under water seal bottle, forming an airtight drainage system—are necessary to remove air and fluid from the pleura, preventing the development of free air (pneumothorax) or free blood (hemothorax).

Complications and Risks of thoracotomy:-

Risks for any anesthesia are⁽⁹⁾:

- Allergic reactions to medicines
- Breathing complications.

Complications for any surgery are^(10,11):

- Deep venous thrombosis in the legs .
- Infection, including in the incision, lungs, bladder or kidney
- Bleeding.
- Cardiac complications or stroke during surgery

complications of the thoracotomy surgery are^(12,13):

In addition to pneumothorax, complications from thoracotomy include air leaks, infection, bleeding and respiratory failure. Postoperative pain is universal and intense, generally requiring opioid, and does interfere with the recovery of respiratory function^(14,15).

In nearly all cases chest tube, or more than one is placed⁽¹⁶⁾. These tubes are used to drain air and fluid until the patient heals enough to take them out (usually a few days). complications such as pleural effusion or hemothorax can occur if the chest tubes fail to drain the fluid around the lung in the pleural space after a thoracotomy. Clinicians should be on the lookout for chest tube clogging as these tubes have a tendency to become occluded with fibrinous material or clot in the post operative period, and when this happens, complications ensue.

In the long term post operatively chronic pain can develop known as thoracotomy pain syndrome, this can last from a few years to a lifetime of continued pain and discomfort. Treatment to aid pain relief for this condition includes intra thoracic nerve blocks/opiates and epidurals although results vary from person to person and are dependent on many numerous factors⁽¹⁷⁾.

Materials & Methods:

This is a descriptive study which was done over a period of 3years in Al-Anbar Governorate in the period of From June 2007 to June 2010 , 130 cases were referred to the department of thoracic & cardiovascular surgery of Al-Ramadi teaching hospital and private hospitals for both elective and emergency indications. All patients underwent thoracotomy and prior to that procedure full preoperative assessment and pre-procedure evaluation for general condition and fitness for general anesthesia were done. For all our patients careful history were taken from the patient or the relative and physical examination were done both for systemic and respiratory system. Radiographic studies include chest radiography and sometimes CT-scan of the chest accompanied with abdomen especially in abdominal indications of thoracotomy. Magnetic resonant imaging and echocardiography also were done less frequently.

The patient fasts at night for both food and fluid, shaving of the chest and axilla where needed in male gender in cases of elective thoracotomy procedure. The patient is received by the anesthesiologist to be the recheck carefully and general anesthesia is given. The commonest position where lateral decubitus position for postero-lateral thoracotomy and supine position for median sternotomy incisions respectively.

After finishing the procedure one or more chest drains left the thoracic cavity to drain any residual fluids or air leaks and abdominal drains put in cases where abdominal drains are needed.

The drains removed where there is no more drain and the usual time is 2-5 days post-operatively and sometimes the chest tube drains left for more days to ensure complete evacuation and of the draining materials. post-operatively the patients received anti-biotic therapy, analgesia ,IV fluids and respiratory physiotherapy according to their pre-operative and preoperative conditions.

Results:

Among the 130 patients who underwent thoracotomy for different indications there is no sex prediction and male: female ratio was 1: 1 and the child age group of the age between 1 day to 10 years was the predominant age group as shown in the following table.

Table 1: Distribution of patients according to age & sex.

Age group	Female	%	Male	%
1 day -10years	13	10%	18	13.84%
11yrs-20yrs	08	6.15%	19	14.61%
21yrs-30yrs	15	11.54%	12	9.23%
31yrs-40yrs	09	6.92%	07	5.38%
41yrs-50yrs	13	10%	08	6.15%
51yrs-60yrs	05	0.04%	01	0.77%
61yrs-above	02	1.54%	00	0.00%
Total	65	50%	65	50%

Both localized wheeze and diminished air entry are the most common clinical findings were found in 30 patients for each. followed by chest pain and

crepitations ,while 10 patients have non-significant clinical findings as shown in Table2.

Table 2:Distribution of cases according to disease history& clinical findings

Clinical findings	No. of patients	%
Localized wheeze	30	23.07%
Diminished air entry	30	23.07%
Chest pain& tenderness	13	10%
Crepitation& fever	11	8.46%
Hemoptysis	09	13.43%
(B.S)* in the chest	08	6.15%
Chocking with feeding	05	3.84%
Easy fatigue	04	3.8%
Dysphagea	03	2.31%
Chest trauma &shock	02	1.53%
Machinery murmur	01	0.77%
Massive air leak	01	0.77%
Elevation=(-ve) arm pulses	01	0.77%
Massive hemothrax	01	0.77%
Chest deformity	01	0.77%
Non-significant(-ve)	10	7.69%
Total patients	130	100%

(B.S)*:-bowel sounds.

All the one hundred thirty patients had chest radiograph in both postero-anterior and lateral views, some patients needed further assessment by CT-scanning, magnetic resonant imaging and echocardiography. The radiological finding

was ranged from round homogenous in 38 (29.23%)patients to enlarged mediastinum12(9.23%)of patients .These findings can be categorized in the following Table3.

Table 3:Distribution of patients according to radiological examination results

Radiological findings	No. of patients	%
Round homogenous shadow	38	29.23%
Enlarged mediastinum	12	9.23%
Air fluid level	11	8.46%
Non-homogenous opacity	10	7.69%
Lung mass	09	6.92%
Obliteration of costo-phrenic angle	09	6.92%
Elevation of hemi-diaphragm	08	6.15%
Lung or lobar collapse	07	5.38%
Missile F.B in the thorax	07	5.38%
Bowel shadows in the thorax	05	3.84%
NG tube coiled in the neck	05	3.84%
Hyper inflated lobe	03	2.30%
Sterna abnormality(lat.view)	03	2.30%
Enlarged hilar shadow	02	1.53%
Cervical rib	01	0.77%
Total no. of patients	130	100%

Among the types of thoracotomy incisions,postero-lateral (right left) thoracotomy was the popular incision

type121(92%) of patients and median sternotomy in 6(4.61%)patients as shown in the Table 4

Table 4 : The types of thoracotomy incisions

Incision	No. of patients	Percentage
Right postero-lateral thoracotomy	75	57.7%
Left postero-lateral thoracotomy	46	35.38%
Median sternotomy	06	4.61%
Axillary thoracotomy	01	0.77%
Anterior thoracotomy	01	0.77%
Posterior thoracotomy	01	0.77%
Total	130	100%

Thoracotomy could be indicated for lung conditions(pulmonary),thoracic conditions (thoracic extra-pulmonary)and extra-thoracic indications, these indications categorized in the following Table5.

Table 5:Pulmonary & Extra-pulmonary Indications of thoracotomy incisions

Pulmonary indications	No.	%	extra-pulmonary indications	No.	%
intact Pulmonary H.C	20	23.25%	Diaphragmatic hernia	09	20.45%
Destroyed lobe	19	22.09%	Hepatic H.C*	08	18.18%
Ruptured H.C	16	18.61	T.E.F*	05	11.36%
Pulmonary mass(tumor)	11	12.79%	Pleural thickening(trapped lung)	05	11.36%
Pulmonary &hepatic H.C	08	9.30%	Mediastinal mass/cyst	05	11.36%
Shell or bullets	05	5.81%	Thymas gland	04	9.09%
Clotted hemothrax	05	5.81%	Achalasia	03	6.81%
Emphysematous lobe	02	2.32%	Cardiac injury	02	4.54%
*****			Patent ductus arteriosus	01	2.27%
*****			Inominate artery injury	01	2.27%
*****			Cervical rib	01	2.27%
Total no.	86	100%	Total no.	44	100%

*T.E.F:-tracheo-esophageal fistula.**H.C:-hydatid cyst.

Indication of thoracotomy incision according to the age of the patient for both pulmonary and extra-pulmonary conditions showed that age group between 21-30years had higher number of patients19among the 86 patient need thoracotomy for pulmonary conditions as shown in table no.(6)while diaphragmatic hernia(D.H) is the

commonest extra-thoracic indication followed by hepatic H.C and congenital trachea-esophageal fistula(T.E.F)as in Table7.

Table 6: Pulmonary indications for thoracotomy & age incidence

Indications	1day-10years	11-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61yeara& above	No.
Intact H.C	3	3	6	2	4	1	1	20
Destructed lobe	8	6	3	1	1			19
Ruptured H.C	2	3	4	2	2	2	1	16
Tumor/mass	----	3	2	4	1	1	----	11
Liver& lung H.C	2	----	2	1	3	----	----	8
Bullet/shell	----	1	1		3	----	----	5
Clotted hemothrax	----	1	1	2	----	1	----	5
Emphysematous lobe	2	----	----	----	----	----	----	2
	16	17	19	12	14	5	2	86

Table 7:Extra-pulmonary (intra-thoracic&abdominal)indications of thoracotomy &age incidence

Indications	1day-10years	11-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61yeara& above	No.
(D.h)	8	----	----	----	1	----	----	9
Hepatic H.C	----	1	4	1	2	----	----	8
T.E.F	5	----	----	----	----	----	----	5
Pleural thickening	----	2	1	2	----	----	----	5
Mediastinal mass /cyst	----	----	2	1	1	1	----	5
Thymus	----	4	----	----	----	----	----	4
Achalasia	----		1	----	2	----	----	3
Cardiac injury	----	1	----	----	1	----	----	2
Inominate artery inj.	----	1	----	----	----	----	----	1
Cervical rib	----	1	----	----	----	----	----	1
PDA	1	----	----	----	----	----	----	1
Total	14	10	8	4	7	1	----	44

According to the type of incision in relation to the pathology want to be violated postero-lateral thoracotomy is the incision of choice to reach most of the

thoracic and extra-thoracic pathologies and median sternotomy used commonly in case of cardiac and thymectomy surgery as shown in table 8.

Table 8:according to the type of incision & pathological finding

	Right postero-lateral thoracotomy	Left posterolat. thoracotomy	Median sternotomy	Anterior thoracotomy	Posterior thoracotomy	Axillary thoracotomy	No
H.c lung	19	17	----	----	----	----	36
Emphysematous lobe	1	1	----	----	----	----	2
Destroyed lobe	12	7	----	----	----	----	19
Clotted hemothrax	4	1	----	----	----	----	5
Pleural thickening	4	1	----	----	----	----	5
Mediastinal mass/cyst	4	1	----	----	----	----	5
H.C lung&liver	8	----	----	----	----	----	8
Diaphragmatic hernia	----	9	----	----	----	----	9
Achalasia	----	3	----	----	----	----	3
Tumors/masses	6	4	----	----	1	----	11
Bulletshell	4	1	----	----	----	----	5
T.E.F	5	----	----	----	----	----	5
Hepatic H.C	8	----	----	----	----	----	8
Cardiac injury	----	----	2	----	----	----	2
Thymectomy	----	----	4	----	----	----	4
PDA closure	----	1	----	----	----	----	1
Cervical rib	----	----	----	----	----	1	1
Arterial injury	----	----	----	1	----	----	1
Total	75	46	6	1	1	1	130

Discussion

Thoracic surgery is the field of medicine involved in the surgical treatment of diseases affecting organs inside (the chest). Generally thoracotomy is treatment option for conditions of the lungs, chest wall components, and the

diaphragm⁽¹⁾. Thoracic surgery due to their deep relation in the field of the work is often grouped with heart surgery and called cardiothoracic surgery⁽²⁾.

The early history of thoracic surgery is linked inextricably to empyema, bronchiectasis, and tuberculosis.

General anesthesia for thoracic operations really only became safe with the development of endotracheal intubation and mechanical ventilation⁽¹⁸⁾.

Thoracotomy is not uncommon and usually well tolerated procedure that needs carefully and through full pre-operative assessment for the patient and careful planning of per-operative surgical modality that needed to the patient followed by good post-operative care for any possible respiratory embarrassment.

Among the 130 patients whom underwent thoracotomy half of them were females and the others were male sex indicating there is no sexual prediction rule.

History and clinical examination for the patients showed that most of our patients had significant clinical findings in 120(92.3%) patients, localized wheezes were found in 30(23.7%)patients and diminished air entry also found in 30(23.7%)patients. This urge that the importance of careful assessment by history and clinical examination to initiate treatment lines for the patients.

For all our patient chest radiograph was done in postero-anterior and lateral manners and some of them underwent CT-scanning image, agnatic resonant image and echocardiography according to the needs to subtle the diagnosis.

Round homogenous opacity were the dominant in the radiological findings 38(29.23%) patients followed by enlarged mediastinal shadow in 12(9.23%)patient and air fluid level lung lesion in 11(8.46%) patients.

Thoracotomy procedure indicated in cases of pulmonary conditions in large number of patients 86(66.15%) including H.C lung, The most common symptoms of pulmonary echinococcosis are cough, fever, chest pain, and dyspnea (19) Ultrasonographic or CT guided fine-needle aspiration of hydatid cyst contents followed by infusion of 95% ethanol as a scolicide and reaspiration known as (PAIR) therapy (Puncture, Aspiration, Injection, and reaspiration) has been practiced in some centers but carries significant risk of dissemination, infection, and anaphylactic reaction as a result of cyst puncture and leakage. (20,21), Tumors of the lung and pulmonary resections but this is not rule out the fact that both extra-pulmonary intra-thoracic and extra-thoracic thoracotomy had acceptable indication number 44(33.84%) of patients such as cardiac, mediastinal, abdominal and congenital conditions (late onset of congenital diaphragmatic hernia (CDH) .

Congenital malformation of the gut and trachea-esophageal fistula still play common indication of thoracotomy in childhood with good prognosis Primary repair of esophageal atresia (EA) with division of the TEF and end-to-end anastomosis is the ideal goal . The standard approach is a right posterolateral thoracotomy. If the patient has a right-sided aortic arch, it might be easier to approach the esophagus from the left thorax. Having the patient tilted forward in the near prone position facilitates access to the posterior mediastinum. For reduction of some of the complications reported with thoracotomy in neonates, namely winged scapula and scoliosis, an Axillary skin crease thoracotomy has been reported by Bianchi et al^[22] and used with good results.^[23]

Late presentation CDH should be repaired as soon as possible because of the risks of incarceration and strangulation of the herniated content, and even sudden death. a thoracotomy may be considered much more frequently than in neonates whenever the presence of firm adhesions within the herniated content into the chest is suspected. Often it cannot be determined preoperatively whether a laparotomy or a thoracotomy is the best method of access, and personal, somewhat subjective preferences may play a role in the decision process^{[24][25]}.

Thymectomy by Median Sternotomy is the most widely employed approach to thymectomy. Although full sternotomy is typical, partial upper sternotomy with extension of the bony incision into the third or fourth intercostal space also has its advocates.^[26] Thoracotomy can be done for all age groups from one day till old age groups if they can tolerate the procedure and there are no clear age limitation unless the patient's condition were unfit for the procedure.

Thoracotomy can be done via many well known types in incisions but the most popular and commonly used is classical postero-lateral thoracotomy incision at fifth intercostal space and rib resection were not needed in all patients 121(93.07%). Median sternotomy incision 6(4.61%) is used with cases of cardiac injuries and thymectomy in cases of myasthenia gravis.

One or more chest tube drain always used with thoracotomy incisions and their removal were highly determined by the draining state and expansion of the lung, early removal may interfere with the prognosis or mandate re-insertion of them. Good anti-biotic coverage, bronchodilators, analgesia and early ambulation including respiratory physiotherapy play important role in the post-operative period.

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