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Emergency management of Hemothorax

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Foreword

It is very pleased to tell you that this work of medical literature is available for your delight with just a few chapters was able to make a synthesis of what many times we have to live in emergencies, in hospitals as doctors and we should simply resolve the clinical or surgical case in a timely manner

Clear is that not always none disease is as always, therefore our discernment as doctors must be grounded so that to the extent possible something can be done for the life of any patient we have at hand

Here we have described approximately 3 chapters in which the 1st tells us the anatomy of the chest very but very synthesizes so that we can quickly and easily discern the anatomical structures of the patient

The second chapter deals with the many ways in which a thorax trauma can be linked to some others injuries that produce the state clinical called SHOCK

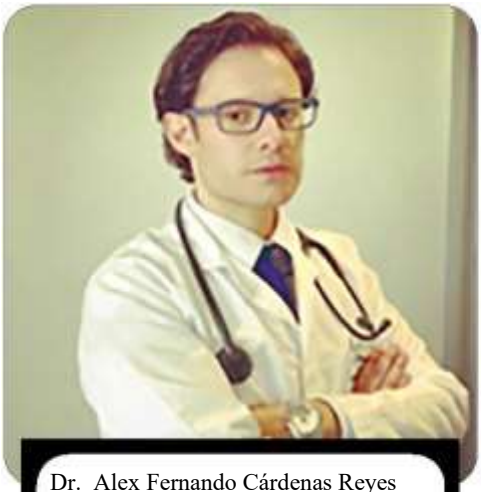
Thanks

It is my pleasure to have in mind the people who were part of this work as my medical colleagues, teaching friends who made sure that this copy of the medical literature was released to the scientific community,
As such I leave my heartfelt thanks to them and therefore without fail to God who has given me strength for the publication of this book.

Dedication

I want to dedicate this medical literature to my parents who have been the fundamental pillar in me for the realization of it.

AUTHORS



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SUMMARY

It is with great pleasure that we announce that this work of medical literature is now available for your enjoyment. In just a few chapters, it summarizes what we often experience in emergencies and hospitals as doctors, where we must simply resolve clinical or surgical cases in a timely manner.

Of course, no two illnesses are alike, so our discernment as doctors must be fundamental in order to do everything possible to save the life of any patient.

Keywords: health, emergency, anatomy, surgery, hemothorax

CHAPTER 1

Thorax anatomy

When defining the rib cage we can say that it is a hollow structure both by the cephalic and caudal region which in addition to that is adynamic structure participating in the respiratory cycles

The types of ribs are referred to as:

- True ribs: are the vertebrocostals from 1st to 7th
- False ribs: they are the vcertebrocondrales that are characteristic of 8th, 9th and 10th
- Floating ribs: are those found in the 11th, 12th, and sometimes the 10th

The differentiation of these structures of the thorax as they are typical ribs is given by the following structures:

- Costal head
- Crest of costal head
- Rib neck
- Costal tuber
- Costal body
- Costal angle
- Costal furrow

In the case of those that are atypical such as:

- 1st rib
- 2nd rib

- 10th rib
- 12th rib

Have features anatomical of those which are can differentiate them as:

- The 1st rib has more transverse diameter, has a tuber dedicated to the musculo escaleno
- The 2nd rib has a reduced transverse diameter this presents a tuberosity dedicated to the anterior serrato muscle
- The ribs 10ma and 12 ava are articulated with a single vertebra
- Ribs 11 ava and 12 ava do not have rib neck or rib tuber

The characteristics of thoracic vertebrae for their differentiation are as follows:

- Two costal fossils or also called dental veneer

- In the transverse processes have some costal fosses with the exception of the 2 or 3 lower thoracic vertebrae
- They have a long, downward-sloping spinous process

- They have lower and upper costal fosses

Those who are atypical present next:

- The T1 vertebra has no dental veneer but structures called T1 costal fosses
- The vertebra T10 consists of complete fossites in the bodies and pedicles
- Vertebrae T11 and T12 have entire costal fosses located in the pedicle

The process thorns have the following characteristics.

- They are long and inclined downwards

- They have superior joint faces

- They have superior joint processes
- Lower joint faces
- Inferior joint process Sternum is one structure central with one ossification cronology to the adult age medium of the thoracic box that its articular characteristic is a:
- Synchondrosis

By making the name we can say that it is made up of the following structures:

- Jugular cleft or also called supraclavicular cleft
- Clavicular cleavage
- Sincondrosis of the 1st rib
- Sternum handlebar articulation
- Angle of sternum

The body of the sternum has the following structures:

- It has a rib opening

Xiphoid process

This structure presents the following anatomical manifestations:

- joint xifoideo esternal
- Infra-esternal angle

Abertura torácica superior has the following limits:

- Behind: by vertebra T1
- To the sides: 2 ribs being left or right
- Front: upper handlebar edge

This has an anteroposterior diameter of 6.5 cm and 11cm transverse, thanks to the inclination

The direction of the rib must be inclined towards the lower antero and the structures passing through it are as follows:

- Trachea
- Esophagus
- Nerves
- Arteries and veins
- Lymphatic

Abertura torácica inferior

This is limited by:

- Back: 12th thoracic vertebra
- Backwards and sideways: by the 11th and 12th ribs
- Forward and laterally: there is the junction of the cartilage of the 7th and 10th ribs, which form the rib arches
- At the front: by the xifoesternal joint

This structure includes the following bodies:

- Diaphragmatic folds
- Esophagus
- Cardioneumenteric nerves
- Vena cava
- Aorta
- Lymph vessels
- Spleen
- Liver

This structure real serves as a the boundary between chest and abdomen

Muscles of the chest wall

The following are those that are part of the chest ofwhich are as follows:

- Upper posterior muscle: this is reinforced by the muscles intercostals from 2nd to 5th intercostal nerve and are responsible for propioception of the ribs which is the elevation of the ribs
- Muscle Serrato posterior inferior: It is innervated by the nerves intercostals from 9th to 11th and the subcostal also responsible for the proprioception which is in charge of descending the ribs
- Rib lift muscle: these are innervated by the posterior branches of the c8-T1 nerves which also raise the ribs
- External intercostal muscles: They are innervated by the intercostal nerve and their function is within the forced inspiration, raising the ribs
- Internal intercostal muscles: They are innervated by the intercostal nerves these have 2 portions that lower the ribs and the condral portion is responsible for raising them within the forced inspiration
- Intimate intercostal muscles: They are innervated by the intercostal nerve these have 2 portions that lower the ribs and the condral portion is responsible for raising them within the forced inspiration
- Subcostal muscle: It is innervated by the intercostal nerve have a function similar to that of the internal intercostals
- Transverse muscle of the thorax: it is innervated by the intercostal nerve which lowers the ribs very slightly

Innervation of the chest wall

Among these we have the typical intercostal nerves that they are:

- Communicants
- Collateral
- Lateral cutaneous branches
- Previous skin patches
- Ramos musculares

We also have the outliers of which are:

- The 1st and 2nd nerve intercostal flow through the face medial of the rib
- The 1st intercostal nerve has no previous cutaneous branch
- The 2nd intercostal nerve gives a branch called intercostobrachial nerve
- Nerves from 7th to 11th innervate the skin and abdominal muscles

Irrigation of the chest wall

The following glasses are going to form part of the arterial irrigation:

- Posterior intercostal arteries
- Anterior intercostal arteries
- Internal thoracic artery
- Subcostal arterial

Venous drainage of the chest wall

The following vessels are within the venous return:

- Right internal jugular vein
- Left brachiocephalic vein
- Right subclavian vein
- Right brachiocephalic vein
- Superior vena cava
- Left upper intercostal vein
- Vena Ácigos
- Posterior intercostal vein
- Vena hemiacigos
- Vena torácica interna
- Subcostal vein
- Right renal vein
- Inferior vena cava

Within the mammary complex we have the following structures:

- Suspensory ligament
- Lobe of adipose tissue
- Sinus galactophorus
- Areola
- Nipple
- Galactophorus duct
- Lobes of the mammary gland
- 6th rib
- Chest fascia
- 4th intercostal space
- Pectoral major
- Pectoral minor
- Subcutaneous tissue
- Space back room
- 2nd rib
- Alveolo

Breast irrigation

The arteries involved of the vascularization of These are as follows:

- Medial mammary branches of the perforating branches
- Anterior intercostal branches of the internal thoracic artery of the subclavian arterial trunk
- Intercostal arteries posterior branches of thoracic aortic arterial trunk
- Lateral thoracic artery branch of the axillary arterial trunk
- Thoracoacromial artery branch of the axillary arterial trunk

Venous drainage

This is given by a venous trunk as is the:

- Vein Axilar

Lymphatic drainage

This is given by the following lymphatic vessels.

- Subareolar lymph plexus
- Axillary nodules
- Pectoral nodules

- Interpectoral nodules
- Deltopectoral nodules
- Supraclavicular nodules
- Inferior deep cervical nodules
- Parasternal nodules
- Abdominal nodules
- Lower sub-diaphragm phrenic nodules
- Mediastinal bronchus nodules
- Jugular lymph trunk
- Right lymphatic canal
- Jugular subclavian venous angle

Innervation

- Intercostal nerves from 4th to 6th being their anterior and lateral branches product of the branching of the brachial nervous plexus
- The brachial plexus is characterized by having mixed synapses so that through these nerves sensory information travels from the mammary skin and sympathetic pathways that collect blood vessels and smooth muscle of the surrounding cutaneous and nipple

Topography

For clinical and surgical purposes, the chest can be divided imaginatively as follows.

- right hemitorax
- left hemitorax
- precordio
- lateral thoracic region
- posterior thorax

A further from this imaginary lines are drawn that they are as follows:

- mediesternal line
- medial clavicular line
- anterior axillary line
- middle axillary line
- posterior axillary line
- Median vertebral line
- Mid-scapular lines

Pleura

It is covered dynamic thanks to the respiratory cycles and its liquid content to avoid frictions within the normal physiology of this structure we can divide it into 2 structures:

- Visceral pleural
- Parietal pleura: this is the one that is innervated

Due to its size and the anatomical regions where it offers its cover may have the following names:

- Costal pleura
- Mediastinal pleura
- Diaphragmatic pleura
- Phrenic fascia - pleural
- Cervical pleura
- Supra-pleural membrane
- Right sternal pleura
- Left sternal pleura

In addition to this because of the deflection and gravity points it is known that these structures exist:

- Receso costodiafragmatico
- Costomediastinal recess

Lungs

They are dynamic structures musculo-fibro-membranosa where the uptake of oxygen and its drainage is carried out by means of the alveoli with the physiology of the V/Q relation

Below we will call the structures of each lung for their differentiation

Right lung:

- Área traqueal
- Groove of the brachiocephalic vein
- Groove of the 1st rib
- Front edge
- Groove of the superior vena cava
- Cardiac imprint
- Horizontal fissure
- Groove of the inferior vena cava
- Oblique fissure
- Diaphragmatic face
- Bottom edge
- Pulmonary ligament
- Groove in the esophagus
- Pleural sleeve
- Rear edge
- Groove of the arch of the acid vein
- Esophageal area
- Vertex

Left lung:

- Area of the trachea and esophagus
- Groove of the aortic arch
- Oblique fissure
- Pleural sleeve
- Groove of the descending aorta
- Pulmonary ligament
- Area of the esophagus
- Bottom edge
- Diagrammatic face
- Oblique fissure
- Lingula
- Cardiac cleft
- Cardiac imprint
- Front edge
- Groove of the 1st rib
- Groove of the subclavian artery
- Vertex

The lungs apart from the multiple structures we have detailed these are divided into:

- Characteristic upper, middle and lower lobe of right lung
- Upper and lower lobe of left lung

The menbrano-cartilaginous division of the trachea is given as follows:

- Right and left lobar bronchi
- Segmental bronchi
- Bronchioles of conduction
- Terminal bronchioles
- Respiratory bronchioles
- Alveolar duct
- Alveolar sac

Macroscopically this is how they are formed the bronchopulmonary segments:

- Lymph vessels
- Pulmonary artery
- Bronquiolo
- Bronchial artery

Microscopically so formed the bronchopulmonary segments:

- Pulmonary vein
- Alveolar capillary plexus
- Septum
- Visceral pleura
- Bronchial artery
- Alveolar sac without plexus
- Intersegmental pulmonary vein
- Intrasegmental bronchial arteries
- Intrasegmentary pulmonary arteries

Irrigation of the lungs and pleura

We have the pulmonary trunk that is responsible for emitting the following sectors:

- Upper right and left lobar arteries
- Lower lobar artery of the left lung
- Inferior and middle lobar arteries of the right lung
- Tertiary segmental arteries

- Upper and lower pulmonary vein
- Middle lobular vein
- Left bronchial arteries
- Right bronchial arteries

Venous drainage

It is given by the following vessels:

- Right bronchial vein flows into the acygos vein
- Left bronchial vein empties into the hemiacigos vein or otherwise into the left superior intercostal vein

Lymphatic drainage

It is determined by the following vessels;

- Superficial lymph plexus
- Lymph nodes in the ilium
- Pulmonary lymph nodes
- Bronchopulmonary lymph nodes
- Upper and lower tracheo-bronchial lymph nodes
- Right and left bronchomediastinal lymph trunks
- Right lymphatic canal
- Chest tube

Innervation

The nerves responsible for the functions:

- Simpáticas
- Parasympathetic
- visceral

They are determined by the parasympathetic presynaptic fibers of the Vagus nerve that makes its synapses in:

- Parasympathetic ganglion cells: their location is in the postsynaptic neurons within their cellular bodies at the origin of the pulmonary plexuses along the path of the bronchial tree

The physiology nervous of these fibres are as follows:

- Bronchoconstriction
- Vasodilation
- Secretory motor skills

In the case of sympathetic fibers they have their location in:

- Cell bodies of sympathetic ganglion cells originating from paravertebral sympathetic ganglia

The functions determined by these nerve bundles are.

- Bronchodilation
- Vasoconstriction
- Inhibitory effects on alveolar glands
- Secretion of pneumocytes type II

The physiology of visceral afferent fibers has reflexive, nociceptive qualities that are detailed below:

- They transport subconscious information
- Because their nociceptors send information about pain

These fibers together with the parasympathetic have shared functions of which they are:

- Tactile sensitivity to cough reflex
- Receptors responsible for the feeling of stretching
- Limitation of the displacement of respiratory movements
- Barorreception that are fully linked to blood pressure
- Regulation of blood gases

The visceral pleura has:

- Nocicettive afferent fibres originating from the visceral pleura and bronchi
- Sympathetic fibers through paravertebral sympathetic trunks
- Parasympathetic fibers from the Vagus nerve, this being the sensitive part

The parietal pleura has:

- Innervation by the intercostal fibers responsible for the sensations of pressure and algesia.
- Innervation by the frenic fibers that is in charge of the respiratory cycle exerted by the diaphragma

Arrangement of regional thoracic ganglia

Upper mediastinal ganglia

- Upper mediastinals
- Upper tracheal
- Prevascular and retrotracheal
- For lower tracheal
- Ganglions of the acyl vein

Aortic ganglia

- Subaórticos
- Paraaortic those that are placed at the level of the ascending aorta

Ganglia lower mediastinal

- Sub-Carinthian
- Paraesophageal
- Those that are part of the pulmonary ligament

Ganglia N1

- Hiliares
- Interlobulares
- Lobulares
- Segmental
- Sub-segments

CHAPTER 2

Shock

to understand this pathological state of emergency it is necessary to understand that the most practical way to define it is as a "short circuit" in our target organs where the life of the patient is either forecasted or critical.

In the basic explanation of shock we must understand the basic functions of the heart.

Thus cardiac output is the multiplication of:

- Systolic volume
- Heart rate

This equation is performed per minute to get an estimate of the blood that pumps the heart for the determined time already stipulated.

Once the above concept is defined now it is important to know what are the mechanisms that the heart uses to fulfill the cardiac cycle of which are:

- Preload
- Contractibility
- Postcharge

The preload is determined by the amount of blood that the venous vessels can store synchronized with the amount of blood reaching the right atrium according to the pressures being handled through:

- Measurement of central venous pressure with the manual tab
- Echocardiography in critical patient

Myocardial contractibility is determined by the law of Frank Starling in which according to the elastance of the fibers and the diameter of the same is fixed the myocardial ejection pump.

Postloading is the anterograde quality of blood flow from systemic vascular resistance.

Pathophysiology of hypovolemia

In the following, we will detail the multiple hypotheses tested by medical science of which are:

- The answer is compensatory in the first instance
- Vasoconstriction in the whole organism
- Centralization of blood to target organs such as kidneys, heart and brain
- The first manifestation of hypovolemia failure is tachycardia
- There is an increase in peripheral vascular resistance
- In the shock state endogenous substances such as histamines, endorphins, bradykinins, endorphins, prostaglandins and cytokines are released
- In the real blood loss shock venous capacitance is the first compensatory sign
- The most appropriate way to replenish what is lost is by the isotonic crystalloids, due to their easy access and accessible cost, but the ideal is the replacement of blood group compatible with the patient as Concentrated Red Blood Cells, so it is essential that in every hospital unit of 2nd and 3rd level there is a bank of blood products for cases like these of shock.
- At the cellular level there is a deficiency of aerobic metabolism for use for proper energy location.
- The lack of compensation of the state of Shock produces a marked lactogenesis with it that does not produce the molecules of adenosine triphosphate that is needed and begins an instability of membrane
- One of the presentations of cellular hypoxia is the presentation of interstitial edema due to the transmission failure of the sodium and potassium pump by membrane instability
- The first step once diagnosed the state of shock is volumetric replenishment with it being able to obtain an adequate organic perfusion
- It should be borne in mind that the management of shock is multidisciplinary in hospital emergency areas

How to recognize a patient in shock

A what to do for proper diagnosis:

- The first instance the doctor in charge of the patient should be with all five senses on the case in the emergency area
- Then take calm and inspect the patient in order
- Once done perform a mental algorithm of the possible causes of the shock state
- The determination of the above steps should be a matter of seconds, there is no time to think
- After that, the patient's airway and proper ventilation are ensured.
- Having the sense of the ear sharpened is ideal for recognition of the vesical murmur once the patient is intubated or with some ventilation device that does not pass the glottis usually called VMNI or non-invasive mechanical ventilation.
- Once the above is done, it is essential to assess the circulatory state and as already stated in previous paragraphs the first sign of shock is tachycardia
- In conjunction with the above action, vital parameters such as blood pressure, heart rate, respiratory rate, temperature, blood glucose and oxygen saturation should be measured
- Blood values such as hemoglobin and hematocrit are used for the determination of pre-existing anemia not for an acute Direct Loss of volume shock
- Bicarbonate deficiency and lactacidemia are prognostic markers of the severity of Shock
- Their measurement within the first 48 hours of resuscitation of the patient are essential for the evaluation of the response to treatment.

Glicemia	70- 100 mg/dl
Temperature	36 - 37.3°C
Blood pressure	120 / 80 mmHg
Respiratory rate	12 -20 breaths per minute
Heart rate	60 - 100 beats per minute
Oxygen saturation	94 - 100%
Lactato sérico	1 – 1,5 mmol/l
Bicarbonate standard	22- 26 meq/l

Determine the cause of shock

- As the pronouncement in previous paragraphs was made only with the inspection of the patient a mental algorithm should be made of the possible causes of Shock

Then below we will call the types of Shock of which are:

- Hemorrhagic shock
- Cardiogenic shock

- Neurogenic shock
- Septic shock

Hemorrhagic shock

It is nothing more than the failure of the volemia expressed with its first parameter which is tachycardia due to real blood loss.

Este may have causes secondary as:

- Cardiac tamponade
- Tension pneumothorax
- Spinal cord injury

- cardiac trauma

The only heroic measure in this type of shock and abolish the bleeding or secondary cause that is producing it

What additional examinations should be requested:

- Rx AP and lateral region affects
- Computed tomography of affected area
- Complete Blood Biometrics
- EMO
- Gas analysis
- Ultrasound fast if needed
- TP and TPT

Cardiogenic shock

The possible causes are as follows:

- Myocardial contusion

- Cardiac tamponade

- Gas embolism

- heart attack

What additional examinations should be requested:

- AP and Lateral thorax Rx
- Chest CT with mediastinal and pulmonary window
- Electrocardiogram
- Emergency echocardiography
- CPK
- CPK -MB
- Troponins I and T
- Complete blood biometrics
- Gas analysis
- Urea, creatinine, uric acid and urea nitrogen
- TP and TPT

Neurogenic shock

Injury caused by craniocerebral trauma with multiple intracranial causes, in the case of spinal trauma has a mechanism of hypotension that with no crystalloid or volemic restorative can improve due to the involvement of sympathetic tone of spinal cord

The symptomatological clinical patient is:

- Hypotension without tachycardia
- Hypotension without cutaneous vasoconstriction
- The presentation of shock always has mixed causes or is due to a craniocerebral trauma that made rostrocaudal deterioration until reaching the bulb or is a thorax trauma that injured the sympathetic tone of the spinal cord

What additional examinations should be requested:

- CT scan of the brain
- CT scan of the entire spine
- Blood Biometrics
- TP and TPT

Septic shock

It is nothing more than a generalized infection that can start from any part of the body and cause organs to have multiple failure.

What additional examinations should be requested:

- Complete Blood Biometrics
- TP and TPT
- Urea Creatinine and Uric acid
- Erythrocyte sedimentation rate
- Electrocardiogram
- AP and Lateral thorax Radiografy
- Lactato sérico
- Venous arterial blood gas
- Calcium
- Tomography of the affected area
- Fast ultrasound if needed

Origin of the transudative spills

- Chronic heart failure
- Liver cancer
- Autoimmune nephrotic pathologies
- Degenerative nephrotic pathologies
- States of malnutrition
- Pulmonary Infarction
- Volumetric overload
- Meigs syndrome

Origin of the spills exudative

- Bronchogenic cancer
- Metastatic cancer
- Lymphoma
- Mesotelioma
- Pleural adenocarcinoma
- Paraneumonicos
- Empyema
- Tuberculosis
- Fúngicos
- Viral
- Parasíticos
- Rheumatoid arthritis
- Wegener's granulomatosis
- Systemic lupus erythematosus
- Churg syndrome - Strauss
- Esophageal perforation
- Subphrenic abscess
- Pancreatitis
- Pancreatic pseudocyst
- Meigs syndrome
- Kylothorax
- Uremia
- Sarcoidosis
- After the coronary bypass
- After the radiation therapy
- Injuries

- Dressler’s syndrome
- Pulmonary embolism with infarction
- Asbestosis
- Silicosis

Empyema

This manifestation is attributed to the presence of pus in the pleural space due to a piogenic infection.

The characteristics of its presentation are as follows:

- Loculated
- Fibrinoso
- Cloudy

The causes of an empyemaare as follows:

- Direct contamination by pneumonic focus
- Septicemia
- Injuries
- After surgical interventions
- Lung abscess
- Infected lung cavity

Clinic of the patient:

- Cough
- Fever
- Expectoration
- Chest pain
- Dyspnea
- Anorexia
- Sweating

Complementary examinations

- AP and lateral thorax Rx
- Computed tomography of thorax with pulmonary and mediastinal window
- Culture of lung secretion
- Complete Blood Biometrics
- Tumor markers
- Urea, creatinine urea nitrogen and uric acid
- TP and TPT
- Lactato sérico
- Gas analysis
- Erythrocyte sedimentation rate
- Glicemia
- Test de GINA - XPERT

Handling clinical - surgical

- Antibioticoterapia
- Analgesics and anti-inflammatory drugs
- Antipyretics
- Gastric protector
- Thoracentesis
- Thoracotomy with valvular drainage at negative pressure

Origin of the kylothorax

- Closed chest and neck trauma
- Thorax and neck penetrating trauma
- Poor central venous catheter insertion
- After a surgical procedure
- Resection of cervical and supraclavicular lymph nodes
- Radical dissection of neck ganglia
- Radical dissection of thorax ganglia
- Esophagectomy
- Surgery of mediastinal tumours

- Metastatic cancer
- Tuberculous lymphadenomatosis
- Mediastinitis
- Linfangitis ascending
- Lymphangioleiomyomatosis
- Deep vein thrombosis
- Congenital

Kylothorax

It is nothing more than the accumulation of lymph between the parietal and visceral pleural pleura in which there is normally serous fluid of approximately 5 to 15 ml in the pleural space that is real.

The macroscopic characteristics of the liquid are:

- Slightly cloudy
- Clear
- Milky
- White

The components microscopic are as follows:

- Triglycerides
- Quilomicrons
- Lymphocytes
- Antibodies
- Proteins
- Fat-soluble vitamins

Clinic of the patient:

- Dyspnea
- Chest pain
- Astenia

Diagnosis

- Computed tomography of thorax with mediastinal and pulmonary window
- Sample microscopy and culture

Handling

- Once diagnosed, interconsultation is conducted in the surgical area
- The surgeon's first order will be to perform a thoracotomy so that the lung has an adequate reexpansion
- As for the complementary support, leave the order of low-fat diet, volumetric replenishment
- Also corrects acid base disorders
- As well as the correction of sodium, potassium, chlorine and magnesium pumps
- Nutrient intake is ideal

With these measures is suitable for the thoracic duct fistula to make its complete closure at the level of the pleura

These measures should last approximately 2 weeks with the constant realization of the income and egresses of the hydroelectrolytic balance

The surgical procedures linked to this pathology are as follows:

- Ligation of thoracic duct
- Block ligation of diaphragmatic hiatus tissue by right thoracotomy
- Pleurectomy: useful in the recalcitrant kylothorax
- Pleurodesis: useful in the recalcitrant kylothorax

Blood loss according to their grades are as follows:

Grade I

- Blood loss up to 750ml
- Heart rate less than 100 beats per minute
- Blood pressure. Normal

- Respiratory rate: 14- 20 beats per minute
- Diuresis : less than 30ml/h
- Mental state: slightly anxious
- Restitution of liquids: crystalloids

Grade II

- Blood loss up to 750ml - 1500ml
- Heart rate less than 100 - 120 beats per minute
- Blood pressure. Normal
- Respiratory rate: 20 - 30 beats per minute
- Diuresis : less than 20 - 30ml/h
- Mental state: alert
- Restitution of liquids: crystalloids

Grade III

- Blood loss up to1500ml - 2000 ml
- Heart rate between 120 - 140 beats per minute
- Blood pressure. Diminished
- Respiratory rate: 30 - 40 beats per minute
- Diuresis : less than 5 - 15 ml/h
- Mental state: between alert and clouded
- Restitution of liquids: crystalloids and blood products

Grade IV

- Blood loss up to 2000 ml
- Heart rate greater than 140 beats per minute
- Blood pressure. Diminished
- Respiratory rate: greater than 35 beats per minute
- Diuresis : oligoanuria state
- Mental state: between confused and lethargic
- Restitution of liquids: crystalloids and blood products

Handling early in the shock

The premise is: "Stop bleeding and replenish loss of blood volume."
It must be done the following:

- Physical examination with ABCDE
- Airway and ventilation
- Circulation and bleeding control
- Neurological deficit
- Presentation and full review
- Gastric distension and decompression
- Vesical catheterization
- Route of vascular access

Therapy with volumetric agents

- The resuscitation of a state of shock is approximately 48 hours in which the patient must be put to response dose and constant hemodynamic monitoring
- Volumetric resuscitation is minimum 30ml/kg
- The use of crystalloids, colloids and blood products is ideal

Evaluation of monitoring

- Vital parameters such as blood pressure, heart rate, respiratory rate, temperature, blood glucose, serum lactate, gas
- Measurement of central venous pressure
- Measurement of urinary expenditure
- Measurement of base acid balance
- Hydroelectrolytic balance of income and expenditure

Return of blood products

Blood cross, specific type and group O

- The objective of this medical procedure is to restore the intravascular volumetric capacitance for adequate oxygen transport.
- Cross-testing for blood transfusion authentication is always preferable
- In the case of exsanguinating hemorrhages and when it is not possible to obtain the blood product, O-type erythrocyte concentrate is given to avoid cases of hypersensitivity

Temperature change to the liquids and to the blood products

- The importance of this procedure is to compensate the hypothermia produced by the state of shock whatever the fluid or its blood-derived defect and the ideal temperature is 39°C

Critical patient reassessment together the prevention of complications

- Persistent bleeding includes repeated surgery until the blood drips or escapes
- Volumetric overload assessment
- If the patient needs treatment and assessment by a more specialized unit, the corresponding management of interconsultations to the different specialties must be done
- Measurement of central venous pressure and continuous assessment of its values according to adjust the income and outputs in the hydroelectrolyte balance

Seldinger technique femoral venopunction

- Place the patient in a supine recumbent position
- Asepsis and antisepsis of the area to be punctured
- With an ultrasound with 2D vascular view the femoral vein is located
- If the patient is not under the effect of depressors of the central nervous system place local anesthesia at the puncture site
- Insert a large-caliber needle with 0.5 to 1ml of saline solution with the needle in the direction of the patient's head with the clamping level parallel to the frontal plane.
- Allow the needle to have a head and back direction while aspirating the bag
- When the flow appears remove it and occlude the needle with one of your fingers to prevent air embolism
- Insert the metal guide and remove the needle
- Insert the catheter over the metal guide
- Remove the metal guide and connect the catheter to the intravenous infusion equipment
- Ask for a chest and abdomen X-ray to verify your proper access

Complications of femoral venous access

- Deep vein thrombosis
- Arterial or neurological injury
- Infection
- Arteriovenus fistula

Subclavian venous puncture

- Place patient in supine position with inverted Tredelemburg
- Place dorsal support for clear view of the clavicles
- Perform asepsis and antisepsis of the subclavian region to be punctured
- Local anaesthesia is infiltrated with lidocaine without 2 % epinephrine
- vascular and 2D ultrasound transducer is placed for venous sighting
- the large-caliber needle is inserted with direction to the supra-sternal fossite after having measured the clavicle and having punctured in the middle third below the bone

    - Always the puncture should be done on level must go towards above
    - Once the puncture of the subclavian vein with the appearance of venous blood in the syringe is verified, the syringe is turned into caudal position then proceed to the introduction of the metal guide
    - It is important to know that if you do not make the rotation of it runs the risk that the metal guide catches the direction of the internal jugular vein and therefore is only a venous access so central venous pressure can not be measured
- The guide line through the entrance to the side of the right to the balloon making it follow its course with the circular device of the same
- Once the entire guide has been inserted but leaving a part in cephalic direction to prevent it from running totally towards the heart and becoming a surgical emergency in which a precordioctomy is needed to remove the metal guide from the heart
- Then proceed to make hemostasis and take out the syringe with the needle holding the metal guide with one hand and with the other taking out the already mentioned
- Once part of the metal guide remains outside the skin, hemostasis is performed again
- Then proceed to the introduction of the central venous catheter by passing the metal guide through the orifice of the catheter that as CVC is introduced part of the metal guide is taken out until it appears in one of the keys of the catheter
- Then hold the metal guide that looks through one of the catheter keys and fully insert the CVC and fully remove this metallic instrument
- Once this is done, each of the catheter keys is tested leaving each of these permeable
- Finally, a venoclisis device is connected to one of the keys and the gravity manoeuvre is carried out, lowering the saline serum below the patient's level, Therefore, if there is venous return from one of the catheter branches then it is the first proof that the CVC is well placed.
- Once the CVC is fixed, portable chest x-ray is performed
- When reading the picture, there should be a pneumothorax and the tip of
  catheter should be level 4th or 5th intercostal space of right hemitorax

Internal jugular venous puncture

- The patient is placed in recumbent position with direction in Tredelemburg
- Supports are placed in the patient's dorsal region to pronounce the supraclavicular fossa
- Asepsis and antisepsis are carried out
- The puncture region is infiltrated with 2% lidocaine without epinephrine
- The ultrasound transducer is placed at supraclavicular and vascular 2D level
- Once the internal jugular vein is located, the large caliber needle is inserted at the intersection of the 2 beams of the sternocleidomastoid lateral to the carotid heartbeat with an angle of 30 degrees in the direction of the posterior plane parallel to the sagittal plane
  - Once the needle is inserted, the venous blood should come out of the syringe
  - The lateral metal guide is then inserted into the syringe tube and by pulling on the wheel of the device this metal instrument is moved forward, leaving a part of the environment in the cephalic direction.
  - Pressure is then applied to the site of the puncture, avoiding The metal guide goes to the heart and the needle is taken out together with the syringe.
  - Hemostasis is performed on the metal guide that is in contact with the skin
  - Then proceed to the introduction of the central venous catheter by passing the metal guide through the orifice of the catheter that as CVC is introduced part of the metal guide is taken out until it appears in one of the keys of the catheter
  - Then hold the metal guide that looks through one of the catheter keys and fully insert the CVC and fully remove this metallic instrument
  - Once this is done, each of the catheter keys is tested leaving each of these permeable
  - Finally, a venoclisis device is connected to one of the keys and the gravity manoeuvre is carried out, lowering the saline serum below the patient's level, Therefore, if there is venous return from one of the catheter branches then it is the first proof that the CVC is well placed.
  - Once the CVC is fixed, portable chest x-ray is performed
  - When reading the picture, there should be a pneumothorax and the tip of catheter should be at the 4th or 5th intercostal space of the right hemitorax.

Proximal tibial puncture and intraosseous infusion

- The patient should be placed in a supine position, where an uninjured leg is selected
- Obtain a limb flexion of approximately 30 degrees
- Putting the heel of the foot on the stretcher
- Usually the puncture is carried out at the anterior and medial level of the proximal tibia at caudal level of the tibial tuberosity
- Asepsis and antisepsis of the puncture region
- Local anaesthetic is placed which is lidocaine at 2% without epinephrine
- At the beginning using a 90° angle with the bevel of the needle directed towards the foot away from the epiphyseal plate
- Inserting a short, thick needle into the skin and periosteum for bone marrow aspiration
- After getting access to the bone direct the needle at an angle of 45 degrees up to 60 degrees in the opposite direction to the epiphyseal plate
- Then advance the needle to the periosteum by traction to the bone marrow
- Remove the stylus and connect the needle to a 12ml syringe containing approximately 6ml of sterile saline

- Inject saline solution to expel any clot that may occlude the needle
- If the saline solution flows with adequate permeability and there is no evidence of edema the needle is well set
- Connect the needle to a large-caliber IV equipment and start the infusion
- Apply antibiotic ointment a sterile gauze

Contraindications

- Infection
- Complete perforation of the bone
- Subcutaneous and subperiosteal infiltration
- Necrosis of the skin by pressure
- Injury of epiphyseal plaque
- Hematoma

Canalization and venous dissection of the internal safena

- The internal saphenous vein is always located at the level of the medial malleolus inspecting the area of the procedure
- The following is carried out: an asepsis and antisepsis
- Then proceed to the placement of local anaesthetic which is 2% lidocaine without epinephrine; It's good to know that epinephrine causes vasoconstriction peripheral and therefore in the distal or peripheral regions of the body it is advisable to use only local anesthetic without this vasoactive
- With the scalpel handle already ready, the blunt cut is made and with a hemostatic clamp the separation of the surrounding tissues is made
- Once done the above with a vascular clamp raises the internal saphenous vein 2 centimeters from the skin
- The internal saphenus is fixed with a ligature by pulling
- A transverse venotomy is then performed by dilating the vein with the closed hemostatic clamp.
- Then the catheter is placed and fixed next to the vein, to prevent this vessel from leaving at a suitable depth
- Then the intravenous infusion equipment is connected to the catheter and the dissection area is closed with separate sutures
- Place sterile gauze once the procedure area has been cleaned with an antibiotic cream

Complications

- Cellulite
- Hematoma
- Flebitis
- Perforation and rupture of the posterior wall of the internal saphenous vein
- Enteric venous thrombosis
- Pulmonary venous thrombosis
  - Section of the internal saphenous nerve
  - Arterial section

Evaluation and management of the shock

Tension pneumothorax

Presents:
- Tracheal deviation
- Distended veins in the neck
- Timpanism
- Absence of vesicular

murmur

Handling:

- Needle decompression
- Thoracotomy tube

Massive hemothorax

Presents:

- Tracheal deviation
- Veins of the neck flat
- Percussion abnormaly
- Absence of respiratory noise

Handling:

- Venous access
- Volume replenishment
- interconsultation of the surgeon
- Placement of thoracotomy tube

Cardiac tamponade

Presents:

- Distended veins in the neck
- Dull heart tones
- Ultrasound with decreased ejection fraction with abundant fluid content between the myocardium and pericardium

Handling:

- Venous access
- Volume replenishment
- Pericardiotomia
- Thoracotomy
- Pericardiocentesis

Causes of hemoptysis

- Lung cancer
- Lung abscess
- Aspergillosis
- Tuberculosis
- Bronchiectasis
- Swan –Ganz¨s catheter
- Cystic fibrosis
- Broncolitiasis
- Presence of foreign body
- Transbronchial lung biopsy
- Tuberculosis

Management in massive hemoptysis

- Administration of laser or topical adrenaline that has momentary effects
- Compulsory surgical resection
- Conservative and expectant treatment
- Broncho-alveolar washing with isotonic solution
- Clogging with Fogarty device
- In patients at risk of mycetomas, the instillation of antimicrobials is
- Cavernostomy in patients too sick
- Bronchial arterial embolization

Antibiotics most used in interventions surgical

Penicillin G

- Produces hydrolysis of beta-lactamases
- Has a short action
- Produce hypersensitivity reactions

Has a microbial spectrum of which is as follows:

- Streptococci spp
- Enterococci spp
- Pneumococcus resistant to penicillin
- Gonococcus producer of lactamase

Ampicillin

- Produces hydrolysis of beta-lactamases
- Has low toxicity but produces diarrhea and rash in cases of hypersensitivity
- Produces hydrolysis of beta-lactamases

Has a microbial spectrum of which is as follows:

- Cocos spp
- Enterococci spp
- Neisseria not producing beta- lactamase
- Haemophilus non-beta-producing - lactamase
- E. coli
- Proteus Mirabilis

Piperacillin

- Produces hydrolysis of beta-lactamases
- Has a short action
- Has low toxicity

Has a microbial spectrum of which is as follows:

- Has a high spectrum
- Species such as pseudomona, acinetobacter and serratia spp

Ampicillin plus sulbactam

- Produces hydrolysis of beta-lactamases
- Its action is short
- It is more effective than ampicillin alone

Piperacillin plus tazobactam

- Produces hydrolysis of beta-lactamases
- Has greater effectiveness
- Effective for pseudomonas spp and acinetobacter spp

Cefazolina

- Beta-lactam mechanisms
- It has a half-life action and low toxicity

Has a microbial spectrum of which is as follows:

- Streptococcus spp
- Enterococo spp
- Esphylococci spp
- Gram-negative

Ceftriaxone

- Beta-lactam mechanisms
- Has a long life of action
- Has a low toxicity

Has a microbial spectrum of which is as follows:

- Pseudomonas spp
- Acinetobacter spp
- Serratia spp

Cefepime

- Beta-lactam mechanisms
- Has a half-life of action
- Has low toxicity

Has a microbial spectrum of which is as follows:

- Pseudomonas spp
- Acinetobacter spp
- Serratia spp
- More effective against Gram-positive coconuts

Meropenem

- Beta-lactam mechanisms
- Disables the dehydropeptidase
- They act on the proximal contoured tubule
- Has a short action life
- It is different from imepenem plus cilastatin as its cause of seizures is low

Has a microbial spectrum of which is as follows:

- Pseudomonas spp
- Acinetobacter spp
- Serratia spp
- More effective against Gram-positive cocci

Ertapenem

- Beta-lactam mechanisms
- Disables the dehydropeptidase
- They act on the proximal contoured tubule
- Has a long acting life
- Has a low toxicity

- Has a microbial spectrum of which is as follows:

  - Has better activity against enterobacteria
  - Have lower activity on coconuts, gram-negative, pseudomonas, acinetobacter and anaerobes

  Norfloxacin

  - Inhibits the bacterial enzyme DNA- gyrase which inhibits replication of
    DNA
  - Has a long acting life
  - Has a low toxicity

  - Very extensive Gram negative activity
  - Very large gram positive activity
  - Pseudomona spp
  - Acinetobacter spp
  - Serratia spp
  - Has a very low activity on anaerobes

Ciprofloxacin

- Inhibits the bacterial enzyme DNA- gyrase which inhibits replication of
  DNA
- Has a long acting life
- Has a low toxicity

Has a microbial spectrum of which is as follows:

- Very extensive Gram negative activity
- Very large gram positive activity
- Pseudomona spp
- Acinetobacter spp
- Serratia spp
- Has a very low activity on anaerobes

Ofloxacin

- Inhibits the bacterial enzyme DNA- gyrase which inhibits replication of
  DNA
- Has a long acting life
- Has a low toxicity

Has a microbial spectrum of which is as follows:

- Very extensive Gram negative activity
- Very large gram positive activity

- Pseudomona spp
- Acinetobacter spp
- Serratia spp
- Has a very low activity on anaerobes

Levofloxacin

- Inhibits the bacterial enzyme DNA- gyrase which inhibits replication of
  DNA
- Has a long acting life
- Has a low toxicity

Has a microbial spectrum of which is as follows:

- Very extensive Gram negative activity
- Very large gram positive activity
- Pseudomona spp
- Acinetobacter spp
- Serratia spp
- Has a very low activity on anaerobes

Gatifloxacin

- Inhibits the bacterial enzyme DNA- gyrase which inhibits replication of
  DNA
- Has a very long life of action
- Has a low toxicity

Has a microbial spectrum of which is as follows:

- Very extensive Gram negative activity
- Very large gram positive activity
- Pseudomona spp
- Acinetobacter spp
- Serratia spp
- Has a very low activity on anaerobes
- With the difference that it is more effective than other quinolones

Moxifloxacino

- Inhibits the bacterial enzyme DNA- gyrase which inhibits replication of
  DNA
- Has a very long life of action
- Has a low toxicity

- Very extensive Gram negative activity
- Very large gram positive activity

  - Pseudomona spp
  - Acinetobacter spp
  - Serratia spp
  - Has a very low activity on anaerobes
  - With the difference that it is more effective than other quinolones

  Gentamicin

  - Binds to a specific protein in the 30S subunit of the ribosome leading to recognition of receptors by means of RNA during the start of formation of the amino acid chain of the bacteria
  - Has a half-life
  - It has presentations as ototoxicity of both branches of the vestibulocochlear nerve

  Has a microbial spectrum of which is as follows:

  - Has a cover for Gram negative bacilli
  - Decreased activity for Estrectococos spp
  - Has no activity for anaerobes

Amikacina

- Binds to a specific protein in the 30S subunit of the ribosome leading to recognition of receptors by means of RNA during the start of formation of the amino acid chain of the bacteria
- Has a half-life
- It has presentations as ototoxicity of both branches of the vestibulocochlear nerve

Has a microbial spectrum of which is as follows:

- Has a sensitivity to microorganisms resistant to gentamicin and tobramycin

Cloranfenicol

- Inhibits bacterial protein synthesis at the bacteria ribosome unit 50S
- Has a long acting life
- Certain doses of this antibiotic cause bone marrow suppression
- In very rare cases medullary aplasia

Has a microbial spectrum of which is as follows:

- Gram positive
- Gram-negative

- H. influenzae
- Most of anaerobes

Clindamycin

- Inhibits bacterial protein synthesis at the bacteria ribosome unit 50S
- Has a long acting life
- Linked to diarrhea by Clostridium Difficile
- Streptococci spp
- Enterococo spp
- Staphylococcus spp
- Most of the anaerobic
- Is inactive against Gram-negative bacilli

Metronidazole

- Its action is still under consideration
- But it is known to have toxic action on anaerobes
- In addition to acting on the Nitro molecule of metronidazole
- Synchronicity with drugs such as disulfiram
- May cause peripheral neuropathy with prolonged administration

Has a microbial spectrum of which is as follows:

- It is very active against the large number of anaerobes
- Is inactive to aerobic and facultative aerobic bacteria
- Active against protozoa like Giardia Lamblia and amoebas
- It is estimated in medical practice that whenever this antibiotic is used it is when there is a polymicrobial infection

Vancomicina

- Inhibits the cell wall by blocking the junction of carboxyl subunits in the peptide subunits D-alanyl D- free alanine
- Affects membrane permeability
- Inhibits RNA synthesis
- May cause red man syndrome
- May also cause hypotension
- Nephrotoxicity
- Ototoxicity

Has a microbial spectrum of which is as follows:

- Estrectococo spp
- Enterococo spp
- Staphylococcus spp
- Clostridium spp

Linezolid

- Acts on the inhibition of bacteria ribosome protein 50S
- Inhibits protein synthesis
- It has low toxicity but in some rare cases may cause myeloproliferative syndromes
- May cause thrombocytopenia
- May cause anemia and leukopenia

Has a microbial spectrum of which is as follows:

- Acts on most Gram-positive bacteria
- Acts on the staphylococcus aureus methicillin resistant
- Acts on vancomycin-resistant enterococci

Tigecycline

- Inhibits protein synthesis that binds to the bacteria's 30S ribosome unit
- Its life of action is long
- Has a low toxicity

Has a microbial spectrum of which is as follows:

- Efficacy on staphylococci spp
- Efficacy on Streptococci spp
- Has no protection against pseudomonas

Fluconazol

- Inhibition of the synthesis of ergosterol which is cytochrome P-450 dependent
- Has a long acting life
- Acts on all fungi except Candida Krusei and Candida Glabrata
- May cause elevation of liver enzymes
- In addition to visual disorders as well as fever

Caspofungina

- Produces inhibition of beta-glucan synthetase which modifies cell integrity causing lysis of it.
- Has a long acting life
- Within the adverse reactions may cause fever
- In addition to very rare changes at the time of infusion
- Acts on most fungi

Anfotericina B

- Causes cell wall instability by blocking sterols in the cell wall
- Has a long acting life
- May cause fever, chills and nephrotoxicity
- Acts on most fungi

Voriconazole

- Inhibition of the synthesis of ergosterol which is cytochrome P-450 dependent
- Has a long acting life
- May cause elevation of liver enzymes
- In addition to visual disorders as well as fever
- Acts on most fungi

Associated factors the dehiscence of wounds

- Aponeurosis protrusions when closing the wound
- Emergency surgery
- Intraabdominal sepsis
- Old age
- Local infection of the wound
- Hematomas
- Seromas
- Increased intraabdominal pressure or PIA
- Obesity
- Chronic use of corticosteroids
- Malnutrition
- Radiotherapy and chemotherapy
- Uremic disorders
- Decompensated diabetes mellitus

Center for desease control and prevention criteria to categorize a surgical focus infection

Organic Space

- Infection less than 30 days after unimplanted surgery
- Infection less than 1 year after implant surgery and infection; this affects any open or manipulated part
- Purulent drainage by a drain placed in the organic space
- Culture of micro-organisms in material aspirated from the organic space
- Access detected by direct scanning or imaging or during reintervention
- Diagnosis of organic space infection by a surgeon

Superficial incision

Infection of less than 30 days after the operation

Affects to the skin and subcutaneous tissue but only one of the following:

- Purulent drainage
- Diagnosis of infection of the superficial surgical focus by a surgeon
- Pain symptoms, flushing, heat and edema

Deep incision

Less than 30 days after surgery without implant and soft tissue involvement

Infection less than 1 year after implant surgery and infection affecting the deep soft parts that are fascia and muscle plus one of the following:

- Purulent deep space drainage but no extension to an organic space
- Deep space abscess during direct or radiological scanning or by recurrent operation
- Diagnosis of deep space surgical focus infection by a surgeon
- Symptoms such as fever, pain or hypersensitivity with wound dehiscence or opening by a surgeon

Risk factors for post-surgical infection of wounds

Those who depend on the patient

- Ascites
- Chronic inflammation
- Malnutrition
- Obesity
- Diabetes
- Extreme ages
- Fatty acid disorder
- Hypoxemia
- Peripheral arterial or venous vasculopathy
- Anemia after the surgery
- Skin changes at the site of injury
- Immunodepression

Those who depend on the environment

- Contaminated drugs
- Insufficient disinfection and sterilization
- Inadequate cutaneous antisepsis
- Inadequate ventilation
- Presence of a foreign body

Those dependent on the therapeutic response

- Drains
- Emergency response
- Insufficient antibiotic coverage
- Preoperative hospitalization
- Prolonged surgical intervention

Isolated microbiological agents after surgery

- Staphylococcus coagulase negative
- Enterococcus group D
- Staphylococcus aureus

- Candida albicans
- E. coli
- Pseudomona auriginosa
- Corynebacterium
- Candida glabratta
- Alpha-hemolytic streptococcus
- Klebsiella pneumoniae
- Enterococcus resistant to vancomycin
- Enterobacter cloacae
- Citrobacter spp

Classification of injuries surgical

Clean wound

- The one that does not present penetration in hollow viscera
- Performing primary wound closure
- No inflammatory reaction effects
- Non-compliance with aseptic measures
- Prolonged surgical intervention

Clean-contaminated wound

- Controlled penetration of hollow viscera
- No inflammatory reaction effects
- Performing primary wound closure

  - Failure of aseptic technique
  - Use of mechanical drainage
  - Preoperative intestinal preparation

  Contaminated

  - Uncontrolled expulsion of organic material from a hollow viscera
  - Predominant inflammation
  - Traumatic open wound
  - Major failure of aseptic technique

Dirty

- Uncontrolled and unmanaged expulsion of hollow viscera
- Presence of pus in surgical wound
- Open wound with suppuration
- Severe inflammation

Clinic of pulmonary embolism

- Pleural chest pain
- Sudden dyspnea
- Tachypnea
- Hemoptysis
- Tachycardia
- Edema of lower limbs
- Pain at palpation of affected lower limb
- Cor- pulmonale
- Hypoxia
- 4th cardiac noise
- Second loud lung noise
- Inspirational crepitations

Causes of renal failure after surgery Those of pre-renal origin

- Septicemia
- Pharmacological
- Volumetric shrinkage
- Hypovolemia
- Bleeding
- Dehydration
- Fat embolism
- Compartment syndrome
- Acute heart failure

Those of parenchymal origin

- Infarto renal
- Amninoglucocides and Amphotericin
- Contrast media
- Interstitial nephritis
- Renal tubular acidosis

Those of postrenal origin

- Acute tubular necrosis
- Calcium oxalate crystals
- Uric acid crystals
- Pigmentos
- Myoglobin
- Hemoglobin
- Pre-existing hydronephrosis

Diagnostic assessment of acute renal failure after surgery

Urinary osmolality

- Of pre-renal origin: values greater than 500 mOsm/l
- Parenchymal origin: consistency similar to blood plasma
- Of postrenal origin: Its consistency may be variable

Urinary sodium

- Of pre-renal origin: Values below 20 mOsm/l
- Parenchymal origin: values greater than 50 mOsm/l
- Of postrenal origin: values ranging from 50 mOsm/l

Fractional excretion of sodium

- Of pre-renal origin: values below 1%
- Parenchymal origin: values greater than 3%
- Of postrenal origin: has percentage variability

Urinary creatinine index/plasma creatinine

- Of pre-renal origin: Values greater than 40%
- Parenchymal origin: values below 20%
- Postrenal: 20% percentage variability

Urinary urea index/plasma urea

- Of pre-renal origin: Values greater than 8%
- Parenchymal origin: Values below 3%
- Of post-renal origin: percentage variability

Urinary osmolality index/Plasma osmolality

- Of pre-renal origin: values less than 1.5
- Parenchymal origin: values greater than 1.5
- Of postrenal origin: numerical variability

Indications of hemodialysis of emergency

- The patient has a serum potassium greater than 5.5 mEq/L
- Ureic blood nitrogen is in the range of 80 to 90 mg/dl
- The patient has recurrent metabolic acidosis measured by arterial blood gas
- Acute volumetric overload
- Medical clinic of uremia, encephalopathy and anorexia
- Elimination of toxaemia
- Platelet dysfunction causing active bleeding
- Presence in the blood chemistry of hyperphosphoremia together with hypercalcemia.

Several of the origins of acute delirium

- Patients in the state of senescence
- Intoxication by alcohol
- Tricyclic antidepressants
- Antihistamines
- Oral hypoglycemic s
- Cephalosporins
- Non-steroidal anti-inflammatory drugs
- Anticonvulsants
- Anxiolytics
- Narcotics
- Beta-blockers
- Digoxin
- Cerebral edema
- Transient ischemic attack
- Neoplasias
- Hipoglicemia
- Hypoxemia
- Hypovolemia
- Thyrotoxicosis
- Hypothyroidism
- Adrenal insufficiency
- Sepsis
- Respiratory failure
- Pulmonary embolism
- Illness pulmonary chronic obstructive
- Liver disorders
- Renal disorders
- Congestive heart failure
- Politraumatismosde great impact
- Delirium in ICU

CHAPTER 3

Thorax trauma

Within the objectives we have to identify and initiate the resolution of the corresponding lesions:

- Obstruction of the airway
- Tension pneumothorax
- Open pneumothorax
- Unstable thorax and pulmonary contusion with marked flap costal
- Massive hemothorax
- Broken heart syndrome

Those pathologies that the life of the person are the following:

- Simple pneumothorax
- Hemothorax
- Pulmonary contusion
- Lesions of tracheo-bronchial ramifications
- Traumatic aortic rupture
- Traumatic rupture of diaphragmatic muscle
- Closed disruption of the esophagus

Initial assessment

It is estimated that the valuation should be as follows:

Attention of the air:

- Perception of its permeability
- Perception of their gas exchange
- Perception of air passing through the upper respiratory tract
- Perception of the audible vesicular murmur with the stethoscope
- Perception of laryngeal stridor
- Perception of the laryngotracheal breath
- Perception of added noise to the vesicular murmur

V/Q - ventilation/ perfusion

- Placement of head and neck in alignment for proper assessment
- Assessment of respiratory movements by inspection and palpation

  - A very important point at the time of oro-tracheal intubation is the exhaustive evaluation of the vesicular murmur
  - In the procedure of intubation care should be taken at the time of introduction of the tube that remains at the level of the tracheal Carina allowing to have both lungs fully ventilated
  - In the case of skipping the previous step the endotracheal tube will go to the main right bronchus for anatomical reasons

  The endotracheal tube in the right place is evaluated as follows:

  - Clinically: auscultating vesicular murmur in the pulmonary bases with all possible permeability without added noise
  - Imaging: a portable chest X-ray is performed in which the lack of pulmonary ventilation by the left hemitorax is evident

  Tension pneumothorax

  Below we will detail the concepts related to this pathology that threatens the life of the patient who suffers it:

  - Its physiopathological mechanism is the one that resembles a unidirectional valve
  - The explanation is the intake of air into the lung without having exit causing pulmonary collapse of one who is affected
  - As the pneumothorax passes without resolution there is movement of the mediastinum towards the opposite side
  - There is decreased venous return and compression of the lung on the opposite side

  - VMNI- Non-invasive mechanical ventilation with positive pressure
  - Concussion of the thorax
  - Failed central venous catheter insertion
  - Enfisematous bullae having an acute disruption near the visceral pleura
  - Rupture of tuberculous caverns

Clinic:

- Chest pain
- Shortness of breath
- Sensation suggestive of difficulty breathing
- Tachycardia
- Hypotension
- Tracheal deviation
- No unilateral air intake
- Distension of the neck veins
- Late manifestation cyanosis

Diagnosis

- AP and lateral thorax Rx
- Pulmonary ultrasound

Handling

- Multidisciplinary intervention is needed
- Must be the surgeon, resident doctor, rotating intern of medicine the graduate and the circulating to perform the respective procedure
- The first rescue measure is lung decompression at the level of the 2nd intercostal space of the anterior thorax with a needle according to the procedure
- The puncture is performed at the level of the mid-clavicular line that for topographical reasons is imaginary

Thorax trauma by open wound

The links of this pathology to the patient and why it should have a timely and specialized resolution will be detailed below:

- First of all it must be a traumatic injury aspirating thorax
- Homeostasis between the atmospheric pressure and that which is exerted by the thorax is really fast
- Air outlet through the defect that is in contact with the outside is a sign that lung injury is through the tracheal bifurcation
- V/Q is affected when hypercapnia occurs and as a consequence hypoxia
-

Diagnosis

- Portable chest x-ray
- Pleuro-pulmonary ultrasound

Handling

- Close the defectionwith sterile occlusive dressings by applying pressure
  due so that this has only a single air outlet which is through the upper respiratory tract and the unidirectional valve mechanism that should have the wound.
- The edges of the occlusion must not be completely airtight to prevent secondary tension pneumothorax
- Consult the surgeon
- Hemodynamic monitor for 24 hours until the multidisciplinary team surgically resolves the lesion

Unstable thorax and pulmonary contusion

Below we will detail the pathological links that result in an unstable thorax and a pulmonary contusion:

- It is the loss of continuity of the rib grill in relation to the rest of the ribcage
- Your presentation is nothing more than the fracture of 2 or more ribs by a high impact accident
- In addition to this it should be known if there is mobile bone fragmentation also unstable thorax
- If the lesion as such is important it should be known that the risk of hypoxia is imminent
- The decreased movement of the chest wall as well as the lung injury as such are determinants for the production of hypoxic state to which a patient may be subjected

Complementary examinations

- AP and lateral thorax Rx
- Thorax computed tomography with mediastinal and pulmonary window plus 3D bone reconstruction
- Complete blood biometrics
- Arterial blood gas
- Lactato sérico
- Rate of erythrocyte sedimentation
- TP and TPT
- Urea, creatinine, ureic nitrogen and uric acid
- Alkaline phosphatase, gamma-glutamyl transpeptidase and lactate dehydrogenase

Handling

- Start non-invasive mechanical ventilation or invasive mechanical ventilation with IPPV ventilatory mode plus a very high sedation scale
- Volumetric replenishment with measurement of the hydro-electrolytic balance by calculating income, expenditure and showing whether the balance is positive
  negative to make the respective therapeutic decisions for patient's well-being

- Administration of antibiotic therapy
- Administration of gastric protectors
- Sedation and analgesia at appropriate doses
- Interconsultation at the cardiotorax service

Keep in mind that the way to proceed depends a lot on the Fast medical history that will be done to the patient upon arrival at the emergency room so it should manifest as follows

Presentation to physical examination of both the Hemothorax and the tension pneumothorax is the abolition or decrease of the vesicular murmur as such

- At the time of physical examination the presence of thoracic hyperresonance suggests pneumothorax
- At the time of physical examination, the presence of a dull sound suggests massive hemothorax
- It should be noted that the 2 pathological entities are cause of hypotension and shock

Assessment of patient circulation

- The pulse in first instance gives an idea if there is cardiac automatism
- In states of hypovolemia the pulse can be abolished and its logic is that when there are these critical states by feed-back the very wise body directs circulation to the target organs which are the heart, kidney and brain

- Therefore, whenever the pulse is to be assessed it should be at the femoral or carotid level
- The characteristics of the pulse that are described in the books of semiology are only for technical beauty of medicine or studies for the creation of new devices that allow to have a faster and clearer idea of the cardiac automatism

Monitoring with the appropriate patient device should be done by:

- Blood pressure
- Mean blood pressure
- Temperature
- Oxygen saturation
- Measurement of CO2
- Heart rate
- Respiratory rate
- Electrocardiographic waves

It is so important the global monitoring of the patient to diagnose in time a:

- Electrical activity without pulse

The prognosis of the patient changes completely and therapeutic decisions can be made in time.

Massive hemothorax

It should be noted that the management in the first instance of this pathological entity saves the prognosis to the patient:

- Massive hemothorax is described as accumulation of blood in the chest box a value greater than or equal to 1500ml thus being almost 1/third or more of the volemia in an average patient of 70kg
- You should know how it has already been explained in the previous lines that its progress without resolution produces sudden hypoxemia
- The symptomatology to the physical examination pass to 2nd plane to have the timely and adequate imaging diagnosis

Examinations complementary

- AP and lateral thorax Rx
- Computed chest CT with mediastinal and pulmonary window in addition to its 3D reconstruction
- Complete Blood Biometrics
- Gas analysis
- TP and TPT

Handling

- Interconsultation to the cardiotorax area
- Putting the knowledge learned in Basic Life Support into action
- Putting the knowledge learned in Advance Cardiovascular life support into action
- Putting the knowledge learned at ATLS into action - advanced trauma life support for physicians
- Volumetric handling in the first 6 hours should be 200ml/h
- The surgeon's assessment should be immediate with the support of the resident doctor, medical intern and nursing staff
- The first surgical procedure should be a thoracotomy with continuous drainage at negative pressure
- Instant replenishment with blood products is the ideal should always be concentrated red blood cells as 1st rescue resource

Cardiac tamponade

The following are details of the pathological links that lead to this acute disease:

Traumas

- Open: penetrating wound
- Cerrado: pericardiorragia

Beck triad by which are the following manifestations:

- Increased venous pressure
- Decreased blood pressure
- Heart sounds off

One of the pathologies thatcan simulate a cardiac tamponade is:

- Tension pneumothorax

The manifest breathing in the patient is referred to as:

- Kussmaul sign: it is nothing more than the increase of venous capacity when inspiration occurs

Another very serious pathological entity that may resemble a cardiac tamponade is:

- Activity electrical without pulse

Complementary examinations

- Echocardiogram
- Eco Fast associated with trauma
- Transtoracic ultrasound
- Abdominal and pelvic tomography for multidisciplinary assessment
- Complete blood biometrics
- TP and TPT
- Gas analysis

Thoracotomy as a rescue measure

- The early assessment to perform this procedure is up to the doctor to know if a cardiac massage should be given in the first instance
- Therefore any patient who arrives to the emergency room for thorax penetrating wound and has electrical activity without pulse is a candidate for toracotomy immediately
- If the patient has been given cardiopulmonary resuscitation in the course of arrival at the hospital should be re-evaluated immediately proceed to do thoracotomy

In addition to thoracotomy, other therapeutic maneuvers can be performed such as:

- Evacuation of pericardiorrhagia that can cause cardiac tamponade
- Direct control of bleeding
- In vivo cardiac massage
- Clipping of the descending aorta

Assessment of chest injuries that tend to be fatal

- Simple pneumothorax
- Hemothorax
- Pulmonary contusion
- Injury of bronchial tracheal ramifications
- Closed cardiac lesions
- Traumatic aortic rupture
- Traumatic lesions of the diaphragm
- Closed esophageal lesion

Simple pneumothorax

- It is the expansion of pleural space by added air
- Penetrating wounds as non-penetrating wounds often cause injury
- In closed trauma the lung laceration with air outlet

Hemothorax

- Placement of a thick chest tube calibre 36 french- 11 mm reduces the occurrence of a coagulated Hemothorax
- Remember that coagulated blood is a breeding ground and therefore if not evacuated can produce sepsis in addition to an empyema
- If there is a blood drain greater than 200ml/ h should continue with transfusions of blood products

Pulmonary contusion

- This may be due to closed thorax trauma
- It is usually potentially lethal more frequent
- The clinical picture of respiratory insufficiency may be masked by compensatory measures of the body so monitoring should be 24 hours

Value vital signs as the The following:

- PaO2: less than 65 mmhg
- SaO2: less than 90%

Give a good idea of what is a gloomy or favourable prognosis

Underestimating a diagnosis such as pulmonary contusion should not be so therefore the diagnosis many times can not be given in the first instance being one of discards in which the following acapites are taken for reference:

- Ventilation
- Oxygenation
- Fluid replenishment
- Letting the body do its feed back

Once the days have passed, the patient must be revalued in order to issue a criterion such as PULMONARY CONTUSION

Injury of tracheo-bronchial ramifications

- Their injury are so rare that if there is damage to these structures the prognosis is discouraging by the depth of their location
- Interconsult to the cardiotórax service is ideal

They have a high mortality rate because it is not only the bronchial tracheal tree injury but can be associated with other injuries such as:

- Thoracic hematoma
- Subcutaneous emphysema
- Simple rib fracture
- Rib flap for thoracic wobble
- Tension pneumothorax
- Simple pneumothorax
- Pericardiorragia
- Cardiac tamponade
- Fractura Le Fort score
- Traumatic brain injury
- Penetrating trauma of the large vessels of the neck
- Injuries of the axillary artery
- Lesions of the subclavian artery
- Lesions of the brachial plexus
- Subclavian angle lesions
- Lesions of the subclavian vein

Contusive cardiac injuries

This pathological entity is defined by the following acute traumatic clinical pictures:

- Rupture of the cardiac cavity
- Valve dissection affects
- Cardiac tamponade

Complementary examinations

- Echocardiogram
- AP and lateral thorax Rx
- Pleuro-pulmonary ultrasound
- Electrocardiogram
- Troponinas T e I
- CPK
- CPK-MB
- Lactic dehydrogenase
- Blood biometrics
- TP and TPT

Break traumatic aortic

- It is one of the common causes of collision by traffic accident
- Often have incomplete rupture of the arterial ligament
- They usually have resistant or recurrent hypotension from another site of bleeding

Details are given below the radiological signs of which are:

- Increse mediastinic size.
- Removal of aortic button
- Trachea deflection to the right
- Left main bronchus depression
- Elevation of the right main bronchus
- Disappearance of the space between the pulmonary artery and aorta
- Deviation of the esophagus to the right
- Widening of the tracheal line
- Increase in paravertebral diameter
- Presence of an apical pleural shadow
- Left haemothorax
- Fracture of the 1st, 2nd, and scapula

Diagnosis of diaphragmatic damage cannot be done in the first instance but can be done:

- Diagnostic laparoscopy

Where it is detected in a timely manner:

- Ruptures of muscle
- Intestinal or peritoneal strangulation
- Pulmonary involvement due to mixed injury

Diaphragmatic injury due to trauma

- The most sensitive place of this muscle is the left side
- The most accurate explanation is that the diaphragm on the right side is covered by a large and massive organ which has greater resistance to high impact collisions

Complementary examinations

- Thorax AP and Lateral Rx
- Chest CT with mediastinal and pulmonary window plus 3D reconstruction
- Echocardiogram
- Pleuro-pulmonary echo
- Fast abdominal and pelvic echo
- Simple computed tomography of abdomen and pelvis
- Electrocardiogram
- Blood biometrics
- TP and TPT
- Alkaline phosphatase
- Gamma glutamil-transpeptidasa
- Lactate dehydrogenase
- Gas analysis
- Lactato sérico

Surgical handling

- Diagnostic and therapeutic laparoscopy
- Rafia of diaphragmatic defects
- Hospitalization in critical care unit
- Reassessment every 24 hours

Esophageal disruption by blunt trauma

- They are completely fatal injuries
- Its shock mechanism is the tipping of the gastric contents towards the mediastinal cavity and as the acute clinical picture progresses the patient exhausts his compensatory measures and his death arrives instantaneously
- The timely treatment of this type of surgical emergencies are complex and more especially due to the fact that time elapsed to a high-resolution hospital so this type of patient die soon

The table clinical of this emergency is equal to:

- Mallory Weiss syndrome

Complementary examinations

- AP and Lateral thorax Rx
- Chest CT with mediastinal and pulmonary window plus 3D reconstruction
- Echocardiogram
- Pleuro-pulmonary Echo
- Fast abdominal and pelvic echo
- Simple computed tomography of abdomen and pelvis
- Electrocardiogram
- Blood biometrics
- TP and TPT
- Alkaline phosphatase
- gamma glutamil-transpeptidasa
- Lactate dehydrogenase
- Gas analysis
- Serum lactate

Surgical handling

- Diagnostic and therapeutic laparoscopy
- Precordial and lateral thoracotomy
- Mediastinal drainage
- Pleural drainage
- Hospitalization in critical care unit
- Monitoring and therapeutic progress every 24 hours

Note that polytrauma is not the same as its definition is as follows:

- Any patient who after a high impact accident has injury of 2 or more cavities

And the definition of multiple injuries is as follows:

- Superficial lesions on the whole body that do not involve cavities of the organism.

Application of imagenology thoracic to diagnostic

Difficulty breathing without imaging findings

- Central nervous system injury
- Micro-aspiration leading to bronchospasm pneumonitis
- Traumatic asphyxia

Fracture of any number of ribs

- Pneumothorax
- Pulmonary contusion

Fracture of the first 3 ribs

- Airway injury and large vessels

Two or more rib fractures

- Unstable thorax
- Pulmonary contusion

Probe nasogastric in thorax

- Diaphragmatic rupture
- Esophageal rupture

Water level in thorax

- Hemo pneumothorax
- Diaphragmatic rupture

Air free below the diaphragm

- Break of abdominal hollow viscera

A large and persistent pneumothorax or loss of air after insertion of the tube by thoracostomy

- Bronchial tree injury Air

image Loculate in thorax

- Diaphragmatic rupture

Fracture of scapula

- Injury of large vessels
- Pulmonary contusion
- Injury of the brachial plexus

Thoracentesis with needle

- Assessment by inspection of the thorax phenotype and its cycling
- Apply oxygen or VMNI

- Locate the 2nd intercostal space at the mid-clavicular line of the tension pneumothorax side
- Asepsis and antisepsis
- Application of local anesthesia
- Place in upright position if cervical spine injury has been ruled out

- In the hand the catheter of about 5cm with the plug at the distal end proceed to puncture on the upper edge of the rib in the intercostal space
- Advance the needle to the parietal pleura
- The catheter plug must be removed and at the moment the air outlet is heard that means that after a prudent time of gaseous drainage the tension pneumothorax has been solved
- The needle is removed, leaving the plastic catheter in place and sealing it with gauze and tape over the insertion site
- The multidisciplinary team should be prepared for the placement of a chest tube of 36 french - 11 mm
- Whenever these procedures are done, a chest X-ray should be performed

Complications

As any surgical procedure presents this type of events a posteriori of which are:

- Local hematoma
- Pneumothorax
- Lung laceration
- Subcutaneous emphysema

Placement of thorax tube

- Inspection of the puncture area as is the 4th and 5th intercostal space at the level of the medial axillary line of the ipsilateral side
- Asepsis and antisepsis
- Local anesthesia with 2% lidocaine without epinephrine
- A transverse incision of approximately 2 to 3 cm is made at the site of placement of the chest tube
- Once the subcutaneous cell tissue has been separated, the opening of the parietal pleural is made with the tip of one of the surgical forceps
- The incision should not be complete to avoid injury of adjacent organs and gradually with the index finger touch the area and cut so that in a few very slight incisions access to the pleural space is obtained
- A clamp must be placed at the proximal end of the tube into which the required length is inserted by means of thoracostomy
- Observe if the tube has air movements or fogs

- After this is placed to the water seal the thorax tube
- Secure the chest tube to the skin with silk suture with cigar technique

- Cover the wound with dressings and put it through for fixation
- A chest x-ray is performed to assess its proper position
- Carry out a gas analysis immediately

Complications

- Laceration or perforation of thoracic organs
- Laceration or perforation of abdominal organs
- Thoracic empyema
- Presence of hemo-pneumothorax
- Presence of intercostal neuralgia
- Tube in unsuitable position
- Chest tube bent or jammed
- Persistent pneumothorax
- Leakage from drainage system
- Air leakage around chest tube
- Leak at water seal level
- Subcutaneous emphysema
- Recurrence of pneumothorax after pneumothorax
- Lack of pulmonary distensibility
- Hypersensitivity to the anesthetic

Pericardiocentesis

- Monitoring of vital signs
- ECG before, during and after the procedure
- It is necessary to immediately perform asepsis and antisepsis of the puncture area as is the xiphoid and subxifoid region
- Apply anesthesia on the puncture area
- Use a 16 or 18 gauge needle of approximately 6 inches connect it to an empty 60cc syringe together with a 3 way wrench
- Echocardiographic evaluation throughout the procedure
- Perform the puncture at an angle of 45 degrees approximately 1 to 2 cm close to the chondro-xifoid junction
- Slide the needle carefully in a cephalic direction with a projection towards the left scapula

- If in the course of needle slippage there is penetration of the cardiac muscle this is plotted on the monitor as a change in the
  T wave that would simulate a myocardial necrosis which would indicate that the needle should be removed, always remember that the echocardiograph must evaluate the whole procedure
- When the needle has reached the pericardial cavity, as much blood as possible is drawn in
  - In the procedure the epicardium again approaches the pericardium and this means that you have to remove the needle and even more if the T-wave path shows any changes on the monitor
  - Once the suction is finished, the needle is completely removed
  - Then place a 3-way wrench securing the catheter in place
  - Another option is to pass a metal guide and pass a catheter and this place the 3-way key
  - As far as possible if the triad of Beck persists continue to drain until reaching the specialized center and a surgeon performs the respective therapeutic

Complications

- Aspiration of ventricular blood instead of pericardial blood due to a direct injury of the endocardium and its defect of the myocardium
- Laceration of the epicardium or ventricular myocardium
- Laceration of the coronary arteries or of the coronary sinus proper
- Presence of new hemo-pericardium due to laceration of coronary arteries
- Presence of ventricular fibrillation
- Pneumothorax secondary to lung puncture
- Puncture of large vessels with gloomy prognosis of cardiac tamponade
- Pneumothorax secondary to pulmonary puncture
- Esophageal puncture with pre-existing Mediastinitis
- Peritoneal puncture with subsequent peritonitis or false positive aspiration

It is must take into account the following:

Obviously from pre-hospital care on Organized handling of:

- Driver of the ambulance
- Paramedic
- Medico
- Nurse

And the presence of drugs and devices suitable in the ambulance will make the clinical or surgical case on its way to a better outcome.

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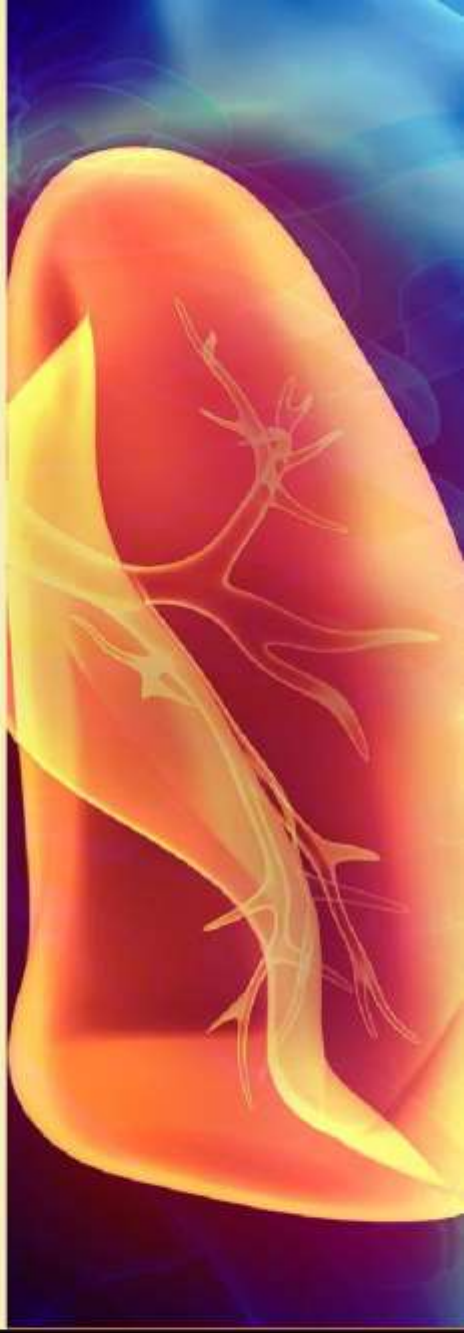
It is a great pleasure to inform you that this work of the medical literature is available for your enjoyment with such

only a few chapters could make a synthesis of what we often have to live in emergencies, in hospitals as doctors and we must simply solve the clinical or surgical case in a timely manner.



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