Mastectomy

Operations covered by this script

- Simple mastectomy without axillary dissection
- Simple mastectomy with axillary sampling
- Simple mastectomy with axillary clearance
- Completion mastectomy
- Salvage mastectomy
- Contralateral mastectomy
- Bilateral mastectomy

Operations not covered

- Skin-sparing mastectomy
- Mastectomy with immediate reconstruction
- Sentinel lymph node biopsy

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How to use a Pantogen Surgical Script

A Pantogen Surgical Script is a quick and easy operative surgical training tool. In a single script, it provides virtually all the expert information one could only otherwise obtain by performing an operation several times. Each script contains the many small steps that a surgeon actually undertakes in performing the operation. Each step is backed up by the appropriate anatomical information and pathological knowledge needed to complete it. In addition, the script presents all the details for avoiding, preventing and solving technical problems.

One may wish to change, edit, update or make alterations to the script. This is entirely appropriate as all surgeons have their own way of doing a particular operation. Additional information can be added as expertise increases.

It is suggested that one reviews the introductory sections to get a general idea about the scope of the script. Then one should read through the script several times. Soon one should find that the steps start to stick in one’s memory along with some of the supporting information. Assist an expert doing the operation. Read the script afterwards and make alterations to the script. Ask to do part of the operation when the opportunity arises. Keep going back to the script after each operation and make any necessary alterations. With time the script will start to become an individual customized version.

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Overview of mastectomy

Mastectomy is the largest operation on the breast outside the field of plastic surgery. The operation consists of removing the breast and also often dissecting axillary contents. For the trainee, it may be the first introduction to a major cancer operation. It requires a thorough knowledge of oncological principles. The details of correct case selection should prevent the surgeon embarking on a mastectomy that may develop complications or prejudice the patient’s future oncological progress.

The detailed description and clarifications of the anatomy and variants, particularly in the axilla, should help the surgeon perform a satisfactory operation. Even the rather amorphous structure of the breast is described in a way that should help the trainee perform the operation satisfactorily.
Case Selection

Usual indications

Mastectomy for carcinoma

- All cases that are not suitable for breast conserving surgery
  - Large carcinoma relative to the breast
  - Central tumours
  - In both cases, breast conserving surgery would leave a very deformed breast.
- Lobular carcinoma
  - Often presents with multifocal disease
  - Patient is at risk of developing metachronous tumours
- Multicentric carcinoma
- Locally recurrent carcinoma after breast conserving surgery
- New primary tumours after previous breast conserving surgery

Completion mastectomy

- After breast conserving surgery has been shown to be inadequate
- Inadequate margins around the primary tumour and a breast too small for a more extensive wide excision

Carcinoma with extensive carcinoma in situ after breast conserving

- Unacceptable risk of invasive carcinoma developing.

Prophylactic mastectomy

- If there is a high risk of malignancy as judge by family history or gene mutation

Patient’s preference

- Some patients would prefer to avoid radiotherapy to the breast
- This is more likely if the patient has had failed wide excision and irradiation treatment for carcinoma the opposite breast, and now presents with a new carcinoma in the contralateral breast

Contralateral mastectomy.

- Some patients, with a very large breast after a mastectomy on the other side, prefer to have the second breast removed as well
The ideal case

- An easier than normal case would be
- A young, thin, fit patient
- Small breast
- Small tumour

The difficult cases

- Obese
- Large breast
- Previous irradiation
- Previous breast surgery
- Recent breast surgery
- Failed wide excision
- Previous breast augmentation
- Previous breast reduction

The unsuitable cases

- Inflammation of the skin
- Fixation to deep tissues
- Oedema of the skin
- Peau d’orange
- Satellite nodules in the skin
- Inflammatory carcinoma
- Extensive distant disease
- Unfit for surgery
- Frail patients with a poor prognosis
- Intercurrent disease
- Patient unable to comprehend the reason for the surgery
Oncology review

Breast

- Death from breast cancer is nearly always due to metastatic spread
- Mastectomy for invasive carcinoma probably does little to reduce this risk of metastatic disease
- Micrometastases have often already occurred when the patient presents with the disease
- Local recurrence in the breast or lymph nodes can be extremely debilitating, but is rarely lethal
- The aim of the mastectomy for invasive carcinoma is to prevent local recurrence
- A prophylactic mastectomy, for non-invasive disease is probably the only type of mastectomy that can improve the patient’s survival per se
- A mastectomy reduces the risk of local recurrence by removing all the pathological tissue in the breast
  - The primary tumour
  - Any other invasive disease
  - Any in-situ malignancy
  - Any malignant cells in transit through the lymphatic capillaries or vessels

Axillary lymph nodes

- The aim of axillary surgery is to stage the disease and to plan treatment
- Removal of axillary nodes per se will not prevent distant metastases and death
- Four or more non-selected nodes are required for accurate staging
- Removal of internal mammary lymph nodes does not improve staging or survival

Axillary sampling versus clearance

- The importance of the extent of node removal is still being investigated
- Histological examination of four or more non-selected nodes from the lower axilla is required for accurate staging
- Evidence suggests that Sentinel Lymph Node Biopsy, removing one or two selected node may provide the same prognostic information
- Axillary clearance is associated with an increased risk of pain, lymphoedema and shoulder dysfunction compared with axillary sampling
- The higher the level of axillary clearance, the higher the risk of such side effects
- Extensive extra-nodal spread into the axillary tissues clinically may warrant a high level of clearance. This may be associated with less morbidity than a lower axillary clearance plus irradiation
Anatomy review

- The following account includes common anatomical problems encountered in surgery of the breast and the axilla. The relevance of particular anatomical points to the operation will be explained.

- The patient lies supine on the operating table, at right angles to the surgeon. This differs from the classical anatomical position where the subject is upright. This can lead to difficulties when reading descriptions of directions in surgical texts. For clarity, this script describes the directions caudal and cephalic rather than superior and inferior.

- The orientation of the structures at operation may differ from the positions described in the anatomy books. When the upper limb is abducted for surgery, the lateral wall of the axilla rotates 90 degrees from the classical anatomical position. For clarity, anatomy textbooks often describe the different anatomical systems in isolation (e.g., the nerves of the axilla). To the surgeon, all these structures will be present at the same time and can be used to his advantage (e.g., the nerves, arteries and veins are often seen as neurovascular bundles) particularly in the axilla.

- The surgeon will often look first for a particular vein. This will guide him to the associated nerve that he is seeking, and alert him to avoid damaging the accompanying structures.

The surgical anatomy of the breast

- Female breasts vary greatly in size, but the base of the breast is relatively constant. It extends from the second to the sixth rib in the mid clavicular line. Removal of even the largest breast should not cause difficulty in skin closure. If the breast is rudimentary, a more limited skin incision will be required.

- A male breast, particularly in older patients, may be as large as a small female breast. The operation of mastectomy in this case is very similar.

- Surgical wounds usually heal best when following skin creases. This applies for removal of breast lumps, where a skin crease incision is usually made. For a mastectomy, the ideal final wound is transverse. This gives the best cosmetic appearance. A transverse wound extending across the sternum often produces an ugly contracture. The incision should be kept lateral to the sternum.

- The posterior axillary skin is often very lax in an older patient. It can make an unsightly redundant fold postoperatively. Extend the mastectomy wound posteriorly to include this skin. The resultant scar lies within the T3, T4 and T5 dermatomes and should cause minimal sensory loss or postoperative pain.

- The breast and the subcutaneous tissues (superficial fascia) are very fatty. The breast fat lobules are generally larger than the fat lobules of the subcutaneous tissue. This is a useful guide when dissecting skin flaps and should ensure that surgery occurs in the correct plane.

- The axillary tail of the breast is very variable in size. Sometimes it is even separate from the breast. It can usually be felt as firmer tissue than the rest of the axillary contents.
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Blood supply of the breast

- The breast has a liberal blood supply from branches of a variety of named vessels. The branches are not large, but they should be identified and coagulated or ligated before they are cut, to avoid unnecessary blood loss.
- Branches of the lateral thoracic artery run from the lower border of the pectoralis minor muscle. They reach the breast either by curling round the lateral border of the pectoralis major muscle, or by penetrating this muscle directly.
- Branches of the internal mammary artery reach the breast by perforating the intercostal spaces. The sites of perforation are usually about 2 cm lateral to the border of the sternum. The second and third perforating branches are the largest and require special attention.
- Branches of intercostal arteries perforate the intercostal spaces laterally. They can retract into the intercostal muscles when cut and can then be difficult to coagulate or suture.
- Two sets of vessels penetrate the clavi-pectoral fascia above the pectoralis minor muscle and pass through the pectoralis major to the breast. These are branches of the superior thoracic artery from the first part of the axillary artery and pectoral branches of the acromio-thoracic artery from the second part of the axillary artery.

Venous drainage of the breast

- Generally the venous drainage of the breast follows the paths of the arteries.
- The tributaries from the lateral thoracic vein from the breast are quite large. They run with one or more branches of the lateral thoracic artery running to the breast. They run almost parallel to the intercosto-brachial nerve (the lateral cutaneous branch of the second intercostal nerve). This “pseudo neuro-vascular” bundle can be confused with the true neuro-vascular bundles of the much deeper subscapular vein and artery and the nerve to latissimus dorsi (thoraco-dorsal bundle).
- If in doubt, identify the cephalic vein. Then find the subscapular vein running into the inferior aspect of the cephalic vein and the nerve on the medial side of the vein.
- Avoid damage to the subscapular artery if at all possible.

Lymphatic drainage of the breast

- There is a subareolar plexus of lymphatic vessels and a submammary plexus lying on the deep fascia of the pectoral major and serratus anterior. The two plexuses anastomose freely throughout the breast.
- Arguments have raged about the need to remove the pectoral fascia and muscle as part of a mastectomy. The muscle was removed in a radical mastectomy. If the tumour is near the fascia, or grossly invading it, removal of the fascia and a cuff of muscle is reasonable to obtain adequate clearance. Otherwise, retaining the pectoral fascia and muscle is conventional practice today.
- Most of the breast lymph drains into the axillary lymph nodes. Some lymph drains into the internal mammary nodes, particularly from the medial side of the breast.
- Intramammary lymph nodes are common, particularly in the tail of the breast.
Skin

- The thickness of the skin flaps does not seem to determine whether there is local recurrence or not
- For best healing, skin flaps at least 1cm should be retained

Surgical anatomy of the axilla

Neurovascular bundles

- In the axilla, there are major neurovascular bundles. They are given names that require some clarification
  - Nerve to latissimus dorsi (thoraco-dorsal nerve) and the subscapular artery and vein
  - Nerve to serratus anterior and the lateral thoracic artery and veins
  - Lateral pectoral nerve and the superior thoracic artery and veins
  - Medial pectoral nerve and the pectoral branch of the acromio-thoracic artery and veins
- There are minor neuro-vascular bundles associated with anterior and lateral branches of the intercostal nerves. The arteries and nerves may be separated from one another by 1-2 cm. The veins may be multiple or aberrant.

Boundaries and contents of the axilla.

- The anterior and posterior walls are triangular in shape. The medial and lateral walls and the base (floor) are rectangular. The apex of the axilla has a triangular opening into the neck.
- The axilla is divided into anterior and posterior compartments by a triangular sheet of tissue running through it. This is the clavipectoral fascia. The pectoralis minor muscle is enveloped by the clavipectoral fascia
- The anterior wall consists essentially of the pectoralis major muscle.
- Pectoralis major runs obliquely up to its insertion into the upper humerus.
- The posterior wall is composed of the teres major, subscapularis and the latissimus dorsi muscles. The latissimus dorsi muscle is drawn laterally by the abducted arm, and is the more obvious muscle of the three. Occasionally extra bands of latissimus dorsi run across the axilla to the medial wall.
- The nerve to latissimus dorsi runs caudally down the muscle accompanied by the subscapular artery and veins as the neuro-vascular bundle to the latissimus dorsi. This nerve and vessels, with the upper limb abducted, are usually well lateral to the serratus anterior and its neurovascular bundle. Sometimes the nerve is 1-2cm medial to the vessels and could be confused with the nerve to serratus anterior. Preservation of the thoraco-dorsal bundle is essential for using a latissimus dorsi flap for breast reconstruction
- The medial wall is the serratus anterior muscle arising from the ribs. The nerve to serratus anterior (long thoracic nerve) runs caudally down the muscle. It forms a neuro-vascular bundle with the lateral thoracic artery and veins. Damage to the nerve to serratus anterior causes winging of the scapula and a disabling loss of shoulder elevation
- The lateral wall is made up of the upper arm muscles, covered with deep fascia. The deep fascia of the muscles also plasters down the axillary artery and the cords of the
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brachial plexus. The lateral and medial heads of the median nerve cover the front of the axillary artery.

- The floor of the axilla, under the skin and the subcutaneous fat (superficial fascia) is a quadrilateral sheet of deep fascia – the axillary fascia. The axillary fascia is attached to:
  - The pectoralis major muscle anteriorly
  - The latissimus dorsi posteriorly
  - The deep fascia of the upper arm muscles laterally
  - The deep fascia of serratus anterior medially

- The hollow of the axillary floor is maintained by traction on the axillary fascia by the clavipectoral fascia

- The apex of the axilla is a triangular shaped gap between the first rib, the clavicle and the scapula. The apex of the axilla transmits:
  - Axillary artery and vein.
  - The cords of the brachial plexus.
  - The lymphatic vessels running to the neck.

- The apical lymph nodes also lie here, close to the axillary vein

- The cephalic vein runs into the axillary vein

- The clavipectoral fascia crosses the middle of the axilla parallel to the anterior and posterior walls. This flimsy sheet of deep fascia runs from the clavicle at the apex of the axilla to the floor of the axilla. It is only 5 – 8cm long. The fascia splits around the subclavius muscle on the lower surface of the clavicle and also around the pectoralis minor muscle. The clavipectoral fascia is better defined above the pectoralis minor than below it. Below pectoralis minor, the sheet of fascia runs down to join the axillary fascia in the floor of the axilla as the suspensory ligament of the axilla

- The medial edge of the suspensory ligament is attached to the origins of pectoralis minor. The lateral edge is attached to the deep fascia of the upper arm muscles. An extension of the clavipectoral fascia, the axillary sheath encloses the axillary artery, but not the vein.

- The axillary vein is therefore easier to identify and dissect out, than the axillary artery and its surrounding nerves and cords of the brachial plexus

- Pectoralis minor runs from the 3rd, 4th and 5th ribs to its insertion into the coracoid process of the scapula. This muscle is the key to an understanding of the anatomy of the axilla. The pectoralis minor muscle divides the posterior compartment of the axilla into 3 parts called axillary levels. With the arm abducted at 90 degrees for a mastectomy or axillary exploration, the pectoralis minor lies very obliquely
  - Axillary level 1 – lateral to pectoralis minor
  - Axillary level 2 – behind pectoralis minor
  - Axillary level 3 – medial to the pectoralis minor

- These levels are relevant to the extent of axillary node clearance

**Level 1 – lateral to the pectoralis minor**

- The axillary vein runs medially in the upper part of level 1 of the axilla. The head of the humerus is a guide to its lateral limit. The vein may be double and have abnormal vessels running into it

- The axillary artery runs laterally in the upper part of level 1 of the axilla. Paradoxically, this is called the third part of the artery

- The third part of the axillary artery is covered by the lateral and medial heads of the median nerve. It lies behind the axillary vein and below the cords of the brachial plexus.

- The subscapular artery branches from this part of the axillary artery. It runs down the length of the latissimus dorsi. It forms part of the thoraco-dorsal bundle with the nerve to latissimus dorsi and the subscapular veins
- The subscapular veins drain into the axillary vein. These vessels and nerve supply the latissimus dorsi. They need to be preserved if the muscle is to be used in a breast reconstruction.
- The lateral thoracic artery branches from the axillary behind the pectoralis minor, but its mammary branches run in level 1 to the breast.
- Intercosto-brachial nerve is the lateral cutaneous branch of the second intercostal nerve. It emerges from the second intercostals space and passes between the origins of the serratus anterior muscle. It crosses the axilla, deep to the axillary fascia. It runs parallel to the branches of the lateral thoracic artery and veins. It can be confused with the much deeper nerve to latissimus dorsi. It leaves the axilla at the lateral edge of the latissimus dorsi. It supplies the skin of the axilla and a variable amount of the skin of the medial aspect of the upper arm. Cutting the nerve does not seem to cause extra pain or anaesthesia compared with preserving it in an axillary dissection.
- Lateral cutaneous branches of the 3rd and 4th intercostal nerves. These branches may also run parallel to the intercosto-brachial nerve in the axilla and mimic it. They supply the skin of the axilla.
- Anterior or pectoral group of nodes. Rather confusingly, they lie on the medial wall of the axilla, on serratus anterior, related to the lateral thoracic artery and the lower border of pectoralis minor.
- Posterior or subscapular group. Related to the subscapular vessels in the posterior part of the medial wall.
- Lateral group. They are closely related to the axillary vein.

**Level 2 – behind the pectoralis minor muscle.**
- The axillary vein maintains its position below and anterior to the axillary artery.
- The axillary artery lies in the upper part of level 2. It has 2 branches here. The acromio-thoracic artery with 4 branches, only one of which enters the axilla. The pectoral branch passes over the pectoralis minor to enter the pectoralis major and breast. It forms a neuro-vascular bundle with the medial pectoral nerve (the lateral pectoral bundle). The lateral thoracic artery runs along the inferior edge of pectoralis minor to supply pectoralis major, minor and the breast. It forms a neuro-vascular bundle with the lateral thoracic vein and the nerve to serratus anterior (long thoracic nerve). Veins accompany the arteries and drain into the axillary vein.
- The medial pectoral nerve derives from its origin from the medial cord of the brachial plexus. It actually lies lateral to the lateral pectoral nerve. It supplies pectoralis minor and pectoralis major. It forms part of the lateral pectoral bundle.
- The central group of lymph nodes lie on the serratus anterior, but higher than the pectoral group. They receive lymph from the level 1 nodes. They are related to the lateral thoracic artery.

**Level 3 – medial to the pectoralis minor, under the clavipectoral fascia.**
- The axillary vein continues to run medially, passing over the first rib to become the subclavian vein.
- The axillary artery runs over the first rib to become the subclavian artery medial to the first rib. It is behind and above the axillary vein and below the brachial plexus.
- The superior (supreme) thoracic artery is the only branch of the axillary artery here. It runs forward through the clavipectoral fascia to supply both pectoral muscles and the breast.
- The superior thoracic artery forms the medial pectoral neurovascular bundle with the superior thoracic vein and the lateral pectoral nerve.
- The superior thoracic veins drain into the axillary vein.
- The cephalic vein pierces the clavipectoral fascia to join the axillary vein.
The lateral pectoral nerve comes from the lateral cord of the brachial plexus. It runs forward to supply the pectoralis major muscle. It communicates with the medial pectoral nerve.

The apical group of lymph nodes receives lymph from the level 2 nodes. They are related to the axillary vein, cephalic vein, superior thoracic artery and vein and Lateral pectoral nerve and cords of the brachial plexus.

The infraclavicular nodes lie above the pectoralis major. They drain lymph from the upper breast and connect with the apical nodes. In general, lymph drains from the apical group to the neck via the apex of the axilla along the subclavian ducts.

The right subclavian duct joins the right jugular duct. The right jugular duct communicates with the circulation at the junction of the right internal jugular vein and the right subclavian vein.

The left subclavian duct joins the thoracic duct. The thoracic duct communicates with the circulation at the junction of the left subclavian vein and the left internal jugular vein.

Pathology

When invaded by tumour, the axillary lymph nodes are hard, due to a stromal (fibrous tissue) reaction that the malignant cells provoke.

When there is extranodal spread, the nodes can mat together and adhere to nearby structures such as fat, veins and nerves. This can make dissection of the nodes difficult and dangerous.

Fatty replacement of some or all the lymphatic tissue in lymph nodes is common.

If you suspect a node is completely replaced by fat, remove more nodes to make sure there are 4 or more nodes for the pathologist to perform staging.

Reactive hyperplasia. This implies some form of immune response by the body. The nodes are enlarged, but firm rather than hard. They cannot be reliably distinguishable from malignant nodes clinically.
Details of the operative steps

Workup

- From the time of diagnosis, the patient should have contact a Breast Care Nurse Specialist.
- A full discussion with the patient about treatment options is required
- A full clinical history and examination are required.
- Look for symptoms and signs of metastatic disease
- Symptom of metastatic breast disease include back pain, weight loss and shortness of breath
- Sign of metastatic breast disease include bone tenderness, hepatomegaly and signs of a pleural effusion
- Special tests, if necessary, are aimed to give more information about the stage of the disease

Special tests

- In the absence of symptoms or signs screening for metastatic disease is not required
- Group and save serum for all patients
- Other tests should be done as the patient's clinical condition requires and according to NICE Guidelines

Section 1  Preliminaries

- Check that you have the correct patient
- Check that you have the correct side and that it is marked
- Check that you have the diagnosis confirmed by a core biopsy with the histology report available
- Consider having the mammograms and other imaging studies available in theatre
- After induction of anaesthesia, position the patient supine on the operating table
- Place the patient on an absorbent waterproof sheet
- Have the upper limb on the affected side abducted at right-angles on an arm board
- Make sure the arm board is attached to the operating table at the level of the patient's shoulder. This will allow clear access to the axilla.
- Check the arm board is at the same level as the operating table.
- This will prevent pressure on the radial nerve under the triceps muscle.
- Have bare skin from neck to umbilicus, and from mid-upper arm to the opposite nipple
- Keep all wires, electrodes, and tubing away from this area, including the posterior axillary fold
- Stand on the side of the lesion with your one assistant either on the opposite side of the operating table or at the other side of the arm board
Section 2  Skin preparation

- Elevate the upper limb
- Have the upper limb lifted to 60 degrees by a theatre assistant holding the hand. This will expose the back of the shoulder for skin preparation
- Clean the skin from the neck to below the costal margin, and from the posterior axillary fold to the opposite nipple
- Use two swabs on sticks with 0.5% Chlorhexidine in 70% alcohol.
- Use another swab to dry off.
- Place one towel on the arm-board up to the posterior axillary fold
- Tuck a large gauze pack under the posterior axillary fold
- Have the upper limb lowered to the arm board and tied down to it
- Place a paper towel up to the costal margin
- Place an abdominal towel up to the inframammary fold
- Place an upper towel over the neck down to the clavicle
- Cover the upper limb with another towel drawn medially to the posterior axillary fold
- Cover the opposite chest to the midline with a further towel
- Fix the drapes with 4 towel clips
- Check all the parts of the diathermy are present, connected and functioning
- Check that the pad is connected to the diathermy machine in the correct socket
- Check that the pedal is connected to the diathermy machine in the correct socket
- Check that the plug is connected at wall socket and the machine is switched on

Section 3  Skin incision

- Include the tumour, biopsy site, any invaded or oedematous skin, plus the nipple-areola complex. You should plan an incision which will leave a transverse wound in most cases. An oblique wound running down towards the xiphisternum is nearly as good cosmetically. An oblique wound running up towards the sternum for upper medial tumours does not look so good, but may rarely be required for an upper quadrant tumour.
- Plan at least 3 cm of skin clearance of tethered, ulcerated, or oedematous skin.
- Estimate the width of the elliptical skin wound which will result from the mastectomy.
- Do this by pressing the skin from above and below with your finger tips.
- If the gap between your finger tips is 8 cm or less, the wound will close primarily.
- For an irradiated breast keep to 6 cm or less
- For a male breast allow 4 cm or less
- If the distances are greater, you risk wound failure or the need to skin graft
- Keep the medial end of the ellipse 1 cm lateral to the mid-line. This avoids a wound contracture following an incision across the mid-line
- Extend the lateral end of the skin ellipse to the posterior axillary line to avoid redundant skin folds in a plump patient.
- Mark the ellipse with a sterile skin marker
- Incise the skin along the marks
Section 4 Dissecting the upper skin flap

- Use two Littlewood’s forceps held by your assistant
- Hold the full thickness of the skin flap with the forceps
- Holding a thinner piece of skin will be insecure or may tear the skin
- Find a bloodless plane between the smaller lobules of the subcutaneous fat, and the larger lobules of the fat in the breast proper. This needs some concentration to find, and can be best seen by standing back a little from the wound. This will produce skin flaps about 1cm thick for satisfactory healing
- If you are too deep there will be excessive bleeding
- If you are too superficial you will devascularise or may ‘button-hole’ the skin
- Use dissecting scissors or diathermy work your way upwards to the second intercostal space.
- As the breast tissue thins you will see the brown of the pectoralis muscle overlying the second intercostal space.
- Coagulate the branches of the internal mammary artery coming through the intercostal spaces 2 cm from the sternum
- Look out for the large branches from the 2nd and 3rd intercostal spaces.
- Use large packs to mop up any surplus blood
- Prevent holing the skin flap by dissecting carefully, by repeated inspection, by looking for light transmitted through the skin, and by warnings from your assistant
- Dissect laterally as far as the head of the humerus felt through the pectoral muscle.
- This will allow easy access to the axilla later
- You should end up with a healthy skin flap up as far as the 2nd intercostal space from the sternum to the humeral head
- The breast will be cleared of skin in its upper half

Section 5 Dissecting the breast

- The aim is to free the whole of the posterior aspect of the breast from the pectoralis major. This technique defines the lower margin of the breast from behind. The lower skin flap will be dissected afterwards.
- Use a mixture of scissor and gauze dissection. Diathermy may also be used
- Continue dissecting behind the breast until you have clearly reached the inferior border of the pectoralis major muscle.
- Roll the breast downwards to display its deep surface to assist this part of the dissection.
- If there has been a previous biopsy or wide excision, deepen the dissection to make sure that you include the walls of the previous the wound. Do not allow spillage of the previous wound haematoma to contaminate the mastectomy wound.
- If the tumour seems to be invading the pectoral muscle excise a cuff of healthy pectoral muscle at least 2 cm clear around the tumour.
- If there has been a previous implant include the fibrous capsule and the implant with the dissection of the breast.

Section 6 Dissecting the lower skin flap

- Hold it vertically with two Littlewood’s forceps.
- Dissect the lower skin flap using dissecting scissors
- Follow the plane between the skin fat and the breast fat
- Continue dissecting between skin fat and breast fat
• Continue to the deep fascia of the rectus abdominis at the level of the infra-mammary skin crease
• Begin from the site of the upper dissection
• Dissect laterally to the lateral end of the wound
• Go right round over the serratus anterior to the vertical fibres of the latissimus dorsi.
• The breast should now be entirely free from the skin flaps anteriorly
• It should be free from its deep attachments in its upper half
• Dissect it from the fascia covering the rectus muscle, and the serratus anterior.
• Continue down to the mid axillary line
• The breast should be attached to the thorax only by the axillary tail and the most lateral part of the breast.
• Identify the upper edge of the axillary tail
• This will be firmer than the fatty axillary contents
• Use a large gauze pack under the lower skin flap
• Use 2 pairs of cholecystectomy forceps placed above the axillary tail.
• Divide the axillary tail
• Remove the breast and send it for histological examination

Section 7 Dissecting or sampling the axilla

• The axilla is divided into 3 levels relative to the pectoralis minor muscle
• This muscle runs almost vertically in the axis of the body from the chest wall to the humerus
  o Level 1 Lateral to the pectoralis minor
  o Level 2 Behind the pectoralis minor
  o Level 3 Medial to the pectoralis minor as far as the clavicle

Axillary sampling

• The aim is to sample at least four lymph nodes in Level 1
• The breast will only be attached to the patient by the axillary tail
• The following dissections are performed as en bloc procedures with the breast
• Elevate the pectoralis major using a Morris retractor
• Display the Level 1 contents of the axilla.
• The pectoralis minor will be visible behind the pectoralis major.
• The axillary fascia in the floor of the axilla is often swept away by this move and is not a problem.
• Incise the clavipectoral fascia. This layer is very flimsy tissue on the lateral side of the pectoralis minor. It may need to be freed from the pectoralis minor with scissors.
• You are looking for four axillary lymph nodes in the lower part of the axilla
• These will be the anterior (pectoral) group on the medial wall of the axilla on the front of the serratus anterior
• You should be well anterior to the nerve to serratus anterior
• You should be just cephalic to the axillary tail of the breast
• Use palpation, gauze dissection and scissor-stretch dissection
• Normal lymph nodes are just palpable brownish, rounded, shiny 5 mm swellings. Reactive nodes are similar but larger. Invaded nodes feel harder, are grey and often adherent to surrounding fat and blood vessels
• Examine each piece of tissue removed, but do not cut it across. This will make the assessment by the pathologist difficult
• If you had planned a sampling only and there a more than 4 suspicious nodes present, consider the pros and cons of converting to a clearance
If you cannot find any lymph nodes, look further cephalically up the axilla and then look further posteriorly in the axilla.

- Coagulate local minor blood vessels before removing the nodes
- Send the specimens for histological examination

**Axillary clearance**

- Find the axillary vein. This is in the upper lateral part of the axilla, just below the head of the humerus. The blue axillary vein is 1 cm in diameter running parallel to the humerus. It will show up with gauze and scissor-stretch dissection in the medial part of the apex of the axilla.
- If you can't find the axillary vein:
  - Look higher in the axilla
  - Feel for the pulsations of the axillary artery to orientate yourself.
  - Look lower in the axilla. You may be too high
  - You may be dissecting the pinkish axillary artery covered by the medial and lateral heads of the median nerve.
  - Higher still, you may be among the pale cords of the brachial plexus.
  - It is always present, and is an important landmark for the axillary dissection
- Dissect the lateral part of the vein
- Dissect medially about to where the subscapular vein drains cephalically up into it
- Avoid the axillary artery posteriorly and the brachial plexus cephalically.
- Avoid damaging the venous tributaries of the axillary vein.
- You will need to divide intercosto-brachial nerves and vessels traversing the apex of the axilla during this dissection.
- Dissect the nerve to latissimus dorsi
- This runs along the medial side of the prominent subscapular vein
- The nerve joins the subscapular vein from behind the axillary vein and is quite deep. It then runs with the vein vertically down the posterior axillary wall which is formed by the latissimus dorsi muscle.
- Use the subscapular vein as a guide to the dissection of the nerve right down where I penetrated the latissimus dorsi muscle
- The nerve is 5 cm or more lateral to the chest wall proper
- Avoid damaging the nearby subscapular artery
- Divide other intercostal nerves plus any incidental vessels as required
- Find the nerve to serratus anterior. This lies quite posteriorly on the medial wall of the axilla. It runs cephalically down the uppermost digitation of the serratus anterior on the medial chest wall. Preserve this nerve
- You are most unlikely to damage this nerve in fact, since it is so high in the axilla
- Divide lateral thoracic vessels. These vessels supplying the breast and associated with the nerve to serratus anterior may be quite large
- Remove all the nodes. These consist of:
  - The anterior nodes on the serratus anterior
  - The posterior group on the subscapularis muscle and latissimus dorsi
  - The lateral group on the axillary vein laterally

**Level 1**

- Dissect the nodes downwards from the level of the lower border of pectoralis minor and axillary vein down towards the breast. Make sure you have preserved the nerves to latissimus dorsi and serratus anterior before you start the dissection.
- Try to remove the nodes en bloc
- Remove any residual axillary fat and nodes to leave level 1 cleanly dissected
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**Level 2**
- Identify the central group of nodes. These lie under the pectoralis minor. They are related to the lateral thoracic artery and veins and the medial pectoral nerve. Palpate the area to see if the apical nodes are invaded as well
- Remove the central group of nodes
- Preserve the medial pectoral nerve
- Display the clavipectoral fascia
- This is the part above the pectoralis minor
- It is more definite than the fascia below the pectoralis minor

**Level 3**
- Find the apical nodes. They lie on the clavipectoral fascia
- They are related to the lateral pectoral nerve and the superior thoracic artery and vein (medial pectoral bundle) and the cephalic vein
- Remove the apical nodes
- Preserve the lateral pectoral nerve, axillary vessels and the cephalic vein
- Remove the breast and axillary contents
- Send the specimen for histological examination
- Achieve haemostasis using diathermy coagulation

**Section 8   Wound closure**
- Pass a suction drain through the lower skin flap at the infra-mammary skin crease 5 cms. from the mid-line. Place the drain tubing underneath the upper skin flap.
- Stitch the drain to the skin. Use 4 half hitchs at skin level, wrapped around the drain 4 times, and then 4 more half hitchs
- Pass a suction through the base of the lower skin flap in the anterior axillary line. Place the drain tubing in the axilla
- Stitch the drain to the skin. Use 4 half hitchs at skin level, wrapped around the drain 4 times, and then 4 more half hitchs
- Test the skin flaps. This will make sure that they will be long enough to close the wound without tension. Ideally the skin flaps should be quite lax when the wound is closed. There should be no difficulty in pulling together the edges which are a maximum of 8 cm apart at this stage. (6 cm in an irradiated breast, or 4 cm in a male breast). Help the closure by getting your assistant to press the skin flaps together using large packs
- If the skin flaps are tight you are in trouble!
- Undermining the flaps further. You will have to undermine about 10 cm to get 1 cm extra length
- Stitch the subcutaneous tissues. This provides the strength in the closure. Place each stitch in the subcutaneous tissue which is much stronger than the fatty layer.
- Start in the middle of the wound with the first stitch. Then place a stitch in the middle of each half wound, then in the middle of each quarter wound and so on
- Continue until the flap edges lie completely together without any gaps
- Avoid puckering the skin with stitches placed too superficially
- Check the swab, needle and instrument count
Section 9  Closing the skin

- Close the skin using continuous sub-cuticular absorbable suture
- Apply a wound dressing
- Apply drain dressings
- Attach the suction system tubing
- Start the suction system
- Open the taps or close the collection container.
- Remove the skin towels

Section 10  Final touches

- Check the suction system is working
- Check that there is no excess blood loss
- Check the skin flaps are against the chest wall
- Write a legible operation note