

# PREPARATION OF THE PATIENT FOR INTRATHORACIC SURGERY\*

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As you know, opening of the thorax, whether it involves an attack upon the lungs, heart, great vessels, or oesophagus, imposes special problems in the care of the patient if the anaesthetist is to ensure his safe conduct through the preoperative period.

## LUNG SURGERY

### *Preoperative Evaluation*

Except for those with acute traumatic emergencies the majority of patients with pulmonary diseases requiring surgery can be assessed preoperatively and optimally prepared for treatment. A careful history of the disease, a good physical examination, and the following specialized examinations are considered very useful in the preoperative evaluation of the patient.

#### *A. History of the patient*

Previous anaesthesia and drug allergy, anaemia, defects in blood coagulation, weight loss, avitaminosis, metabolic deficiencies, and psychic preparation are to be considered. Cough habits, quantity and character of sputum, extent and duration of smoking habits, and oro-dental hygiene should be evaluated.

#### *B. Physical examination*

Much valuable information can still be obtained by listening to the chest: rales, ronchi, character of breathing, tracheo-bronchial secretions can be best evaluated by physical examination.

#### *C. Specialized examinations*

The necessity and advantages of a preoperative X-ray of the chest are self-evident. Often laminography and bronchography must be included. Complete evaluation of pulmonary function and cardiac reserve is imperative. Laboratory examinations should also be made.

*Pulmonary function* studies may be divided into the mechanical and alveolar respiratory phases. Mechanical tests consider the lungs as bellows and the tests are either static in type (for vital capacity, inspiratory capacity, tidal air, expiratory reserve, residual capacity, total lung volume) or dynamic (for timed vital capacity, walking ventilation and maximum breathing capacity), sometimes bronchspirometry is necessary. Alveolar respiratory tests are concerned with the quantity and quality of gaseous exchange at the inspiratory, alveolar, capillary, and tissue levels. They include tests for intra-pulmonary gas mixing, diffusion tests, and arterial blood studies.

For the evaluation of *cardiac reserves*, the venous pressure and circulation time are two very helpful tests. Moot's test is an additional good criterion of cardiac reserves. This test multiplies the pulse pressure by 100 and the figure obtained is

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divided by the diastolic pressure. Electrocardiogram tracings are taken before and after exercises.

The following *laboratory examinations* are also done before anaesthesia for lung surgery: urinalysis; complete blood count; hematocrit reading; blood volume; total blood protein; blood typing and Rh factor; pre-transfusion cross-matching, bleeding and coagulation time, prothrombin time (quick method); sed rate; phenol-sulfonephthalein test, blood urea; sputum culture; antibiotic sensitivity.

### *Preoperative Care*

From the clinical findings, the clinical examination, and the specialized examinations (X-ray studies, cardio-pulmonary function tests, and laboratory tests) the anaesthetist may arrange a better preparation for the patient scheduled for lung surgery.

#### *A Hygiene*

Smoking should be reduced. Tracheo-bronchial irritation should be avoided. Oro-dental hygiene should be improved. Upper respiratory and sinus infections should be controlled. Alcoholism should be under control.

#### *B. Blood, electrolyte, and metabolic deficiencies*

Anaemia, blood volume, fluid balance, avitaminosis, and metabolic deficiencies should be effectively controlled with iron, transfusions, electrolyte solutions, vitamins, and a good diet. Even though the patient is receiving a well-balanced full diet, it should be supplemented by Thiamin (40 mg./day), nicotinic acid (300 mg./day), Riboflavin (40 mg./day) and ascorbic acid (50 mg./day). Patients who have a tendency to bleed should also receive vitamin K (75 mg./day).

#### *C Antibiotic therapy, INH problems*

Tuberculous patients require specific antibiotic therapy: streptomycin, Dihydro-streptomycin, P.A.S., and I.N.H. Patients under treatment with isonicotinic acid derivatives, especially the isopropyl derivative, have shown oxygenation problems and convulsions at the anaesthetic period. To avoid this complication we now routinely stop this medication two to three weeks before surgery.

#### *D. Aerosol therapy and drainage*

If needed, aerosol therapy with penicillin or streptomycin may be instituted before surgery. Postural drainage remains an important adjunct to all preoperative preparation.

#### *E. Pulmonary insufficiency*

Pulmonary insufficiency is treated by respiratory exercises under the supervision of a trained physiotherapist. Patients are taught how to breathe and cough. Emphysematous patients are given positive pressure, ACTH treatment, and also Aminophyllin which is mainly helpful when there is an elevation of the venous pressure. Bronchodilators such as "Vaponefrin" given in aerosol may be indicated in obstructive endo-bronchial lesions.

#### *F. Premedication*

For premedication, less depressive sedatives are used routinely. "Demerol" ("Pethidine") associated with Atropine seems to be in favour. A few use only

barbiturate with Atropine. Especially for nervous and anxious patients, a few others use Phenothiazine derivatives: Promethazine, Phenergan, Chlorpromazine (Largactil), associated or not with barbiturates during the immediate preoperative days.

### G. *Cardiac failure*

Cardiac failure remains one of the prime causes of difficulty in the postoperative period and is the most common cause of mortality in the early postoperative period. Therefore digitalization of the patient has been used preoperatively if the history or physical examination suggest cardiac embarrassment.

## HEART AND GREAT VESSELS SURGERY

### *Preoperative Evaluation*

The preoperative selection of all patients must be made by the anaesthetist in collaboration with the cardiac surgeon and cardiologist. The compiling of the history and the evaluation of the severity of symptoms in relation to the physical findings and specialized examinations enable the anaesthetist to forecast whether it will be possible to maintain adequate heart action during the epicardiac and intracardiac manipulations.

#### A *History of the patient*

The patient is evaluated by a careful history of the disease and general condition (history of heart failure, history of systemic embolism, total body weight, diuresis, insomnia and nervousness), and by repeated observations of heart rate, respiratory rate, blood pressure, and metabolic deficiencies.

#### B *Physical examinations and specialized examinations*

Important too are physical examinations of the heart and specialized examinations such as: X-ray studies, electrocardiogram tracings, pulmonary function tests, venous pressure and circulation time, angio-cardiography, and cardiac catheterization. The same laboratory examinations suggested for lung surgery are also very useful for the right evaluation of the cardiac patient.

#### C *Hypotension and Keown's test*

As Kenneth K. Keown says in his chapter on "Anaesthesia for Cardiac Surgical Operations": "Hypotension is extremely common in all patients with acquired lesions of the heart except those with aortic insufficiency or coronary artery disease, and a very practical phase of preoperative evaluation and anaesthetic management is the determination of the systolic and diastolic blood pressure of the candidate for heart surgery in the supine position, in comparison with that obtained with the patient in the lateral position, which will usually be used during surgery. This is done prior to any preliminary medication, in an effort to determine the normal for the specific individual. In general there is a decrease in systolic pressure of 10 mm. of mercury and a slowing of the heart rate." This lowering of the blood pressure, according to Kenneth Keown, is the base line for premedication.

Aside from the circulation itself, it is wise to test the response of the patient to the planned premedication.

For this purpose, preoperative drugs (Barbiturate, Demerol, Atropine) are

given and the patient's response is noted for the following hours with respect to his pulse, blood pressure, breathing, and any other reactions.

Some doctors also routinely evaluate the adrenal cortical capacity by the eosinophil depression test and use this to decide whether adrenal cortical support will be necessary during and after operation.

### *Preoperative Care*

The cardiac patient is prepared for surgery by minimizing decompensation, to give the patient the greatest possible cardiac reserve. This is done by the usual methods of correcting cardiac failure such as bed rest, oxygenotherapy, digitalis, correcting the electrolyte balance, diuretics, low-salt diet, liver damage improvement and antibiotics; in addition, if indicated, anticoagulants and proper sedation.

#### *A. Hygiene*

Before cardiac surgery as before lung surgery, smoking should be reduced, orodental hygiene improved, upper respiratory infections and metabolic deficiencies controlled, and a good diet supplemented with vitamins should be instituted.

#### *B. Digitalis*

The goal in the immediate preoperative period is to bring the patient into the best possible state of cardiac compensation. Digitalis is used for congestive heart failure or atrial fibrillation.

The proper regulation of digitalis is important. Over-dosage is manifested by ventricular conduction or alterations in the pace maker. It is important to avoid dangerous arrhythmia at the time of operation. Administration of potassium (3.0 gr./day) may be useful since hypokalaemia potentiates the toxic effects of digitalis. However, this supplemented potassium must be withheld the day before operation so that the patient does not face the usual postoperative oliguria with an excess of potassium. It is usually best to maintain the form of digitalis that the patient has been receiving. The dose is regulated so that the apical rate is consistently in the range of 80-90 per minute.

#### *C. Quinidine and Procaine Amide*

The routine prophylactic use of Quinidine or Procaine (either the amide or the hydrochloride) before or during operation is contra-indicated because of the obvious undesirability of depressing the myocardium. Hearts depressed by such drugs go into a state of arrest more frequently.

#### *D. Electrolyte balance*

The authors found that generally stores of sodium in the body and in serum were in the normal range but total body water was almost invariably increased.

A few patients, generally those who have had severe congestive heart failure requiring prolonged sodium restriction and vigorous mercurial diuresis, manifest an actual depletion of sodium stores because of restriction and diuretics. The desperately ill patients have a low serum sodium value. A value in the range of 118 to 125 milliequivalents is considered by Black and Harken as a sign of impending death (in a week). The management of this electrolyte problem consists of continued salt restriction and limitation of fluid to 1000 to 1500 cc. a day to avoid serum dilution, daily weighing of the patient is a most important step. The

urinary sodium concentration should also be measured. Moore says: "Salt loss through the kidneys may exist. In this situation, urinary sodium is elevated to more than 30 milli equivalents per litre. Below 25 milli equivalents in urine with a low serum sodium the renal tubules are considered normal. In general it is better to delay operation until the serum sodium level reaches 130 milli equivalents per litre or above."

#### E. *Diuretics*

In the preparation of the cardiac patient for operation the judicious use of diuresis is of the utmost importance. The studies of Wilson and his associates have repeatedly demonstrated a high total body water even in the absence of gross oedema, furthermore, the diuretic response of many non-oedematous cardiac patients justifies this step. Because the diuresis often leaves the patient fatigued on the following day, the diuretic should be given at least forty-eight hours before operation. Even patients with no obvious oedema are given a dose of 1 cc. of Mercurhydrin early in the preoperative period. If the patient has a marked response to the first dose of the mercurial diuretic it should be repeated at intervals of forty-eight to seventy-two hours until the "optimal dry weight" has been reached. Several conditions may explain a lack of response to 1 cc. of Mercurhydrin: the patient may be in a satisfactory state of compensation and not have occult oedema; the serum chlorides may be low, necessitating ammonium chloride in doses of 6 to 8 gm. a day for several days before the mercurial diuretic is repeated, or a 2 cc. dose may be indicated.

Potentialiation of diuretics may also be obtained by the administration of aminophylline (0.25 to 0.5 gm.) by vein half an hour after the mercurial diuretic.

#### F. *Low-salt diet*

Most patients who have had evidence of congestive heart failure will have been placed on a low-salt diet (200 mg. of sodium) at some time before hospital admission, but if this has not been done, the diet obviously should be instituted as an adjunct to the measures discussed above for the preoperative period, with the sole exception previously mentioned.

#### G. *Liver damage*

With patients who have definite enlargement of the liver, operation has been delayed for at least a week or ten days for rest and preparation. The liver profile of bilirubin, total protein and albumin-globulin ratio, prothrombin time and thymol turbidity is obtained to document the clinical impression of a liver disturbance. These patients are placed on a high-carbohydrate, low-fat diet, with vitamin B supplements in addition to choline, methionine, inositol, and folic acid.

Obviously, a patient who has been on long-term Dicumarol therapy for arterial embolism should be taken off the drug and the prothrombin time allowed to return to normal before any operative procedure is contemplated. Vitamin K is administered for any abnormally prolonged prothrombin time not traceable to anticoagulant therapy.

#### H. *Antibiotics*

Forty-eight hours before operation parenteral injection of penicillin is begun. This is supplemented by aerosol penicillin and streptomycin in patients with mitral stenosis in whom chronic pulmonary suppuration is present.

### J. *Hematocrit*

In congenital heart disease with increased hematocrit, dehydration must be avoided before operation because of the danger of cerebral thrombosis.

### K. *Proper sedation*

The pre-anaesthetic medication is directed towards reducing physical and mental strain and lessening cardiac irritability. According to Keown, for mitral stenosis Pentobarbital sodium ("Nembutal") 0.10 to 0.20 gm. (gr. 1½-gr. 3) is given by mouth the night before operation. Secobarbital sodium 100 mgm. is ordered if the systolic blood pressure in the right lateral position is 100 mm. of mercury or higher by palpation of the left radial artery. If the pressure is between 90 and 100, 50 mgm. of Secobarbital is ordered. If the pressure is less than 90, no barbiturate is given. This is given by mouth 60 minutes prior to induction of anaesthesia. Atropine Sulphate is ordered for hypodermic administration at the same time, the dose being determined by the radial pulse rate. If the pulse rate is 60/min. or less, Atropine 1/100 is given; for a pulse rate between 60 and 80, gr. 1/150 Atropine, from 80 to 100, gr. 1/200 Atropine. In aortic stenosis, Glyceril Trinitate, 0.3 (gr. 1/100) to 0.6 mg. (gr. 1/200), is added to the same pre-medication as for mitral stenosis for prevention or treatment of angin-episodes. For tricuspid stenosis, preliminary medication is similar to that given to patients with aortic or mitral stenosis. For mitral insufficiency, the medication is about the same and we must remember, always according to Keown, that these cases are the most serious and the more difficult to manage: if in the lateral position the systolic pressure is less than 80 mm. of mercury, the patient should be turned back to supine position and the operation cancelled for that day. For aortic insufficiency and coronary artery diseases a barbiturate followed by Demerol and Atropine is given. Glyceril trinitate is also given in coronary disease. According to McQuiston, for congenital heart lesions, a 2- or 3-month-old infant, weighing only 7 or 8 pounds, is given Morphine Sulphate 1/48 and Atropine Sulphate 1/300, as the age increases the amount of Morphine Sulphate and Atropine Sulphate is increased so that a 4-year-old child receives Morphine Sulphate gr. 1/8 and Atropine Sulphate gr. 1/200. For children 5 years of age to puberty, Morphine Sulphate gr. 1/8 and Scopolamine gr. 1/200 is usually administered. Age and not weight is the determining factor of the size of the dose. With congenital heart lesions, some are using 1 mg. of Demerol or of Meperidine per pound of body weight in children up to puberty or those weighing 100 pounds.

## OESOPHAGUS SURGERY

### *Preoperative Evaluation and Care*

Patients requiring oesophagectomy present profound disturbances in fluid and nutritional balance; and we know that nutritionally depleted patients are relatively poor anaesthetic risks. Before operation, a partial restoration of body stores and satisfactory restoration of the fluid balance performed by the anaesthetist in co-operation with the surgeon, will permit for these patients the safe performance of the transthoracic resection of the oesophagus.

### *Oesophagectomy*

To realize this for oesophageal operations, the anaesthetist requires the routine preoperative laboratory examinations as for other surgery. The anaesthetist must

study with the surgeon the history of the patient and decide whether or not the patient is able to support the resection and if so, when the patient will be ready for surgery. A careful investigation of the cardio-respiratory system is imperative before performing surgery.

Patients who have had congestive heart failure, coronary artery disease, or auricular fibrillation or flutter are prepared cautiously when the intravenous route is used for alimentation. Oro-dental hygiene should be attended to and antibiotics given. In preparing such a patient for surgery, an oesophageal lavage must be done and a gastric tube passed if possible into the stomach prior to the patient's being taken to the operating room. Proper premedication must also be ordered by the anaesthetist.

#### *Oesophageal Repair*

A patient needing this treatment may be only a few days old and very frequently a tracheo-oesophageal fistula exists. An aspiration pneumonia may be present. To reduce the incidence and severity of aspiration pneumonitis, the infant is wrapped in blankets, placed in an oxygen tent with the foot of the bed elevated slightly, and turned hourly from the prone position to the right and then to the left side.

#### *Oesophagus*

In order to reduce the danger of aspiration of mucus and saliva from the blind upper oesophageal segment, a small soft rubber catheter is passed into this pouch via the nose. Gentle suction is applied at frequent intervals.

Nutritional depletion is usually not a significant factor in newborn infants with congenital atresia, when the diagnosis is made within the first day or two after birth. The problem of dehydration is more important at this time. Fluids may be administered by hypodermoclysis or intravenously.

The infant is given gr 1/500 of Atropine Sulphate intramuscularly about ten minutes before being transported to the operating room.

### RÉSUMÉ

Au cours de ce travail, nous allons démontrer le rôle joué par l'Anesthésiste dans la préparation du patient pour chirurgie thoracique.

#### *Anesthésie et chirurgie pulmonaire*

A. Une histoire détaillée de la maladie, un examen physique complet et certains examens spéciaux tels les radiographies, les tests de la fonction cardio-respiratoire, et les examens routiniers de laboratoire sont considérés comme très utiles pour l'évaluation d'un risque chirurgical. Cette évaluation doit se faire de concert avec l'Interniste et le Chirurgien.

B. Suivant les renseignements que lui ont fournis ces examens, l'Anesthésiste doit: (a) Si nécessaire, instituer le traitement hygiéno-diététique le plus approprié à son patient; (b) Restaurer les déficiences métaboliques, l'équilibre électrolytique, et surtout le volume sanguin; (c) Installer de l'aérosolthérapie si nécessaire; (d) Diriger le physiothérapeute et faire faire du drainage postural s'il y a lieu; (e) Améliorer si possible l'insuffisance respiratoire; (f) Cesser, si le malade en reçoit, l'Isoniazide et surtout l'Ipromazide afin d'éviter en cours

d'anesthésie, certains troubles de l'hématose et certaines complications neurologiques d'ordre convulsif; (g) Décider de la technique anesthésique à employer; (h) La veille de l'intervention, ordonner la prémédication la moins dépressive possible (on conseille surtout le "Demerol" associé à "l'Atropine" et chez les anxieux, le "Phénergan" ou le "Largactil."

#### *Anesthésie et chirurgie cardiaque et des gros vaisseaux*

Ici encore, une histoire détaillée de la maladie, un examen physique complet et certains examens spéciaux (électrocardiographie, angio-cardiographie et cathétérisme cardiaque) sont considérés comme très utiles pour l'évaluation d'un risque chirurgical. Egalement, cette évaluation doit se faire de concert avec le cardiologiste et le chirurgien.

Le test d'hypotension de Keown a certainement une grande importance et certaines gens recommandent en outre d'étudier la réponse du patient à la prémédication future

L'opéré cardiaque est préparé en minimisant la décompensation et en augmentant le plus possible ses réserves cardiaques.

Ceci est fait par le repos au lit, l'oxygénothérapie, la digitalisation, la balance des électrolytes, les diurétiques, la diète hypo-salée, l'amélioration de la fonction hépatique et s'il y a lieu, les anticoagulants, les antibiotiques et une sédation appropriée.

Pour la prémédication, la ligne de conduite de Keown semble être la plus suivie.

#### *Anesthésie et chirurgie de l'oesophage*

A. Les patients nécessitant une résection de l'oesophage présentent la plupart du temps, des troubles sérieux de la nutrition. Aussi, c'est un devoir impérieux pour l'Anesthésiste de corriger ces troubles avant de permettre l'intervention.

Si la voie I V. doit être employée et si ces patients montrent certains signes de défaillance cardiaque, on doit le faire avec précaution. Encore là, la fonction cardio-respiratoire doit être bien étudiée avant l'intervention afin de déterminer si le patient peut la supporter.

Une sonde gastrique doit toujours être présente et le lavage de l'estomac doit être fait avant de diriger le patient à la salle d'opération

B. Lorsqu'une fistule trachéo-oesophagienne existe, afin de réduire l'incidence de la pneumonie d'aspiration, l'enfant, en l'occurrence le nouveau-né, est enveloppé dans ses couvertures, placé dans la tente d'oxygène avec le pied du lit élevé et tourné aux heures, de la position ventrale à la position latérale tantôt gauche, tantôt droite. Une sonde gastrique doit être mise en place et la déshydratation corrigée adéquatement.

Une fois l'enfant bien préparé, il est dirigé vers la salle d'opération et de "l'Atropine" à la dose de gr 1/500 est administré environ 10 minutes avant l'intervention

En conclusion, nous pouvons dire que les succès actuels de la "Chirurgie Thoracique" sont, dans une grande mesure, dus à la bonne préparation des patients et nous espérons avoir démontré le rôle joué par l'Anesthésiste dans cette préparation.