THE ANAESTHETIST AND PULMONARY TUBERCULOSIS

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IN this paper, we are going to describe the organization of an Anaesthesiologic Department in a modern sanatorium where major chest surgery is done for tuberculosis patients, the description will include the role played by the anaesthetist during the pre- per- and post-operative periods.

The Preoperative Period

As many of them represent poor anaesthetic risks, the importance of a very attentive preparation on these pulmonary cases will be realized. We routinely request the following examinations:

1. Clinical findings and physical examination.
2. Laboratory examinations.
3. X-ray.
4. Some cardio-pulmonary function test:
 - (a) Vital capacity
 - (b) Timed vital capacity
 - (c) Maximum breathing capacity
 - (d) Ventilation equivalent
 - (e) Minute volume
 - (f) Blood gas analysis
 - (g) Venous pressure
 - (h) Circulation time
 - (i) E.K.G.

From the results of these examinations, the anaesthetist may arrange a better preparation for the patient, for whom the following things are carried out by the anaesthetist or a qualified person:

1. Restoration of fluid balance (Fluid and blood transfusion).
2. Aerosol therapy (Streptomycin and Vaponefrin).
3. Postural drainage.
4. Physiotherapy.
5. Preoperative sedation.

Our patients under treatment with isonicotinic acid derivatives, especially the isopropyl derivative (Marsilid¹), have shown oxygenation problems and convulsions at the anaesthetic period. We now routinely stop this medication one month before the operation in order to avoid such complications.

The Preoperative Period

With the best anaesthetic technique, these patients present many problems:

1. Reduction of static lung volume
 - (a) Reduction of usable vital capacity

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*Proprietary name: Hoffmann-La Roche.

- (b) Increase of residual capacity
- (c) Increase of functional residual air.
- 2. Inadequate dynamic lung volume
 - (a) Reduction of tidal air
 - (b) Reduction of maximum capacity
 - (c) Inadequate minute volume
 - (d) Abnormal ventilation equivalent.
- 3 Paradoxical respiration.
- 4. Mediastinal flutter.
- 5. Lessening of cardiac output and blood volume.
- 6. Delay in the venous return.
- 7 Hypoxemia or anoxemia.
- 8. Arterial-venous shunt.
- 9 Reflex problems.
- 10 Aspiration of secretions and spread of disease problems.

As the thoracic operation is taking place in the cardio-pulmonary area, which is one of the most reflexogenic zones of the body, both the surgical stimulus and the anaesthetic agents are prone to cause hypotension, bradycardia, arrhythmia, or even cardiac arrest.

As a preventive it might be well to mention preoperative topical anaesthesia of the whole tracheo-bronchial tree, intercostal nerve blocks, a good plane of general anaesthesia, good oxygenation of the patient, and sometimes an intravenous injection of a ganglioplegic drug.

Pulmonary tuberculosis patients frequently show a reduction of blood volume and anaemia. Replacement therapy with blood, plasma, or plasma expanders and electrolytes is imperative in order to avoid shock and anoxemia.

Paradoxical respiration and mediastinal flutter are also serious problems, they can be minimized by intubation techniques, controlled or assisted respiration, and the face down position (Overholt).

Anaesthetic agents are a matter of choice At Laval Hospital, we use intravenous anaesthetic agents, curares combined with nitrous-oxide Oxygen technique. For one reason or another, after a satisfactory understanding with the surgeons, cyclopropane or ether techniques are also used for some special cases.

Recently, for poor-risk patients, we tried a new technique of sedation of the autonomic nervous system devised in France by Huguenard and Laborit with "Cocktailtyque". Demerol, Diparcol, Phenergan, Largactil, associated or not with local or regional anaesthesia.

For intubation, endobronchial anaesthesia with Carlen's tube is our first choice, the advantages of this technique have been summarized as follows, by Dr. Carlen in *Anesthesiology*, January 1953 issue:

- 1 Once the chest is open, the diseased lung may be deflated to provide greater operating space when the lung is separated from the chest wall.
2. The lung can be inflated when lobar or intersegmental planes are developed.
3. The bronchus can be divided, whenever this is suitable during the resection and left open until it is convenient to close it. During the time the bronchus is

open, a small plastic catheter is left in place for continuous suction, with suction close to the opening of the bronchus to collect blood and secretions.

4. It is not necessary to apply a clamp on the proximal part of the bronchus, thus injury to the bronchial wall is avoided.

5. The bronchial tree may be inspected and aspirated by a small rubber catheter through the open bronchus.

6. Bronchotomies and resection of the carina and of the tracheal wall are facilitated by this method of endobronchial anaesthesia.

7. In wet cases during repeated aspirations one lung is always ventilated and the same plane of anaesthesia can be maintained more easily. In some pneumonectomy cases with empyema we use endotracheal or endobronchial tubes along with the Thompson's blocker.

Before the time of Thompson's blocker and Carlens' catheter we had to rely on simple intubation with endotracheal or endobronchial tubes. However, in children's surgery, the tracheo-bronchial tree does not allow any other technique and we still use these simple intubations.

Last year, Dr. Carlens paid a visit to our hospital and told us that five thousand cases were done in Sweden with his catheter with many advantages and without any harmful incident.

Up to now, at Laval Hospital, this technique of bronchial anaesthesia (Carlens' tube) has been used in more than five hundred cases: pulmonary resections, decortications, thoracoplasties. We tend to agree with Dr. Carlens' remarks. This tube is also used at our hospital for bronchspirometry. Its introduction is relatively smooth. Nevertheless a previous bronchoscopic examination is helpful.

The functions of an anaesthetist are not limited to the choice of good anaesthetic agents. He must also pay a close attention to the heart action and to the arterial oxygen saturation. In this the cardiathacoscope and the oximeter may prove to be of great help.

If a cardiac arrest occurs, the anaesthetist should immediately look for close co-operation between the members of the surgical team. Without delay the surgeon performs cardiac massage for adequate circulation. The anaesthetist, on the other hand, administers oxygen under positive pressure. Everyone knows that thoracic surgery often means large amounts of blood lost. This may be immediately estimated by the weighing of the sponges and later on the post-operative ward, by blood volume dye test method. Then the blood volume is maintained at normal level by adequate replacement of blood loss.

The Postoperative Period

For the anaesthetist, the recovery period is as important as the operative one. During the first postoperative hours, the anaesthetist stands by the patient as long as he needs his services. In the following days, in co-operation with the surgeon, the anaesthetist supervises oxygenation, blood transfusion, fluid balance, sedation, aerosol therapy and physiotherapy. The pulse rate serves as a barem for oxygenation, a pulse of one hundred or over per minute is an indication for extending the oxygenation for two hours. The Anaesthesiologic

Department, in our hospital, is also responsible for the Blood Transfusion Service. About one hundred transfusions monthly are given on active surgical wards.

According to fluid balance, the anaesthetist orders fluids and electrolyte solutions.

We routinely try to use less depressive sedatives (Demerol, Levodromoran), infiltration blocks with cyclaine or xylocaine, 5 per cent alcohol solution given intravenously. According to Dr. Mary Knapp of Wesley Memorial, Chicago, 5 per cent alcohol solution given intravenously increases the caloric intake, has a special value for patients with inanition, and reduces by 30 to 50 per cent the need of narcotics postoperatively.

The most serious respiratory complication, atelectasis, is jugulated by carbon dioxide inhalation in association with the physiotherapy practised in the immediate postoperative period, aerosol therapy (Streptomycin, Vaponefrin, Alevaure) and bronchial toilet by aspiration or broncho-aspiration are also helpful. But the use of some anaesthetic techniques has greatly reduced the post-operative respiratory complications for our patients.

As everyone knows, the anaesthetists work more often in the Surgical Department than in the Medical Department, however, our services are also required by latter department to dispense to their patients the same services: oxygenation, blood transfusion, aerosol therapy, nerve blocks, reanimation and also appreciation of anaesthetic risk

In conclusion, we may say that the recent advances in thoracic anaesthesia have greatly enlarged the thoracic surgical Field.

RÉSUMÉ

Au cours de ce travail, nous allons démontrer le rôle joué par l'anesthésiste dans un centre de chirurgie thoracique en tuberculose.

I A la période pré-opératoire, l'anesthésiste se doit de bien connaître son patient afin d'être en mesure de le bien préparer à l'intervention. Il doit s'intéresser surtout à l'examen clinique pré-opératoire et aux examens de la fonction cardio-respiratoire. Suivant les renseignements que lui ont fournis ces examens, il doit:

- (a) restaurer l'équilibre électrolytique et surtout le volume sanguin;
- (b) instituer de l'aérosolthérapie si nécessaire,
- (c) diriger le physiothérapeute;
- (d) décider de la technique anesthésique à employer,
- (e) ordonner la prémédication la veille de l'opération.

En tuberculose pulmonaire, les problèmes communs à la chirurgie thoracique ne font que s'aggraver.

II. A la période opératoire, une bonne oxygénation est de rigueur, peu importe l'agent anesthésique employé. A l'ouverture de la paroi, l'infiltration intercostale est faite pour prévenir certains réflexes vagues et la respiration contrôlée ou assistée est pratiquée pour lutter contre la respiration paradoxale et le ballonnement médiastinal.

Dans nos milieux, à cause de l'usage courant de l'électro-cautère, nous utilisons

la technique Protoxyde d'azote oxygène avec emploi de substances intra-veineuses : anesthésiques, sédatifs et curarisants. Pour les raisons mentionnées par le docteur Carlens lui-même, dans la revue *Anesthesiology* de janvier 1953, la sonde Carlens est notre premier choix comme technique d'intubation. A date, elle a été utilisée dans plus de cinq cents cas : résections pulmonaires, décortications, thoracoplasties.

Nous employons aussi le bloqueur Thompson, une sonde endo-bronchique ou une simple sonde endo-trachéale. Dans quelques cas limites au point de vue respiratoire, nous avons aussi employé le "Cocktailytique" de Huguenard et Laborit associé au non à l'anesthésie locale ou régionale.

Au cours de l'opération, le cardiothacroscope et l'oxymètre sont des aides précieux pour l'anesthésiste dans la surveillance de son patient. En présence d'arrêt cardiaque, l'anesthésiste doit pourvoir à l'oxygénation par tous les moyens possibles. Enfin, il doit maintenir le volume sanguin en remplaçant adéquatement le sang perdu.

III Pour l'anesthésiste, la période post-opératoire est aussi importante que l'opération elle-même. Dans les premières heures de la réanimation, il demeure avec son patient aussi longtemps que l'état de ce dernier l'exige.

Par la suite, de concert avec le chirurgien, il prend charge du service de l'oxygénation, de la transfusion, de l'aérosolthérapie et de la physiothérapie.

En conclusion, nous pouvons dire que les succès actuels de la chirurgie thoracique sont dans une grande mesure dus aux progrès de l'anesthésie thoracique moderne.

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