PULMONARY COMPLICATIONS FOLLOWING REGIONAL ANALGESIA FOR ABDOMINAL OPERATIONS

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REGIONAL analgesia for abdominal operations is a valuable form of anaesthesia in suitable cases, but as is the case with all forms of local and general anaesthesia, it is not devoid of risks. Pulmonary complications, which are always a source of worry to the anaesthetist, are not unknown.

It is always difficult to obtain accurate figures of the incidence of pulmonary complications following any form of anaesthesia or analgesia, for though the fault in many instances may be in the anaesthetic agent or technique used, it frequently happens that one or other of these is unjustly held responsible for pulmonary conditions, which though first diagnosed post-operatively, had been present and perhaps missed at clinical examination before operation. In the case of local analgesia the task is even more difficult as some form of local anaesthetic is frequently used in preference to any form of general anaesthetic, for a surgical operation on a patient suffering from acute or chronic respiratory disease, and in such a case it may be impossible to determine whether the local analgesia has or has not aggravated the existing respiratory condition.

In this series of 100 abdominal operations, including both "cold surgical cases" and abdominal emergencies, X-ray examination of the chest was made both before and after operation, and cases showing any active respiratory disease present before operation were not included.

The technique of regional analgesia for abdominal operations has been well publicised. For this series the local anaesthetic agent used for the thoracic block was 1/1,000 solution of anethaine (amethocaine) with adrenaline 1/300,000. The lower 6 or 7 dorsal nerves were blocked on both sides,
each injection of about 11 c.c. of anethaine solution was made into the selected intercostal space, at a distance of 4 inches lateral to the spinal column. For the posterior splanchnic block (Kappis method) 50 to 60 c.c. of 1/3,000 solution of anethaine with adrenaline was injected on each side:

Premedication. For this purpose omnopon was found to be the most satisfactory drug, and was given either by hypodermic or intravenous injection. One c.c. of a sterile solution of omnopon containing gr. 1/3 was mixed with 2 to 3 c.c. of sterile distilled water for intravenous use; this was found to mitigate the unpleasant symptoms of nausea, vomiting and sweating which frequently follow the intravenous injection of omnopon, though even with this method the average female patient seldom tolerated more than gr. 1/3, and the average male gr. 2/3 in each dose without developing some discomfort. Repeated doses of omnopon were necessary in most cases; the first dose was given about 1½ hours before operation, the second immediately before the regional block was started and the third dose before the start of the surgical operation. The maximum analgesia effect of the drug was obtained in 2-3 minutes, and maximum narcotic effect in 15 minutes after intravenous injection.

Complications.
The following table shows the number of pulmonary complications in this series of 100 cases:

<table>
<thead>
<tr>
<th></th>
<th>Pneumothorax</th>
<th>Lung abscess</th>
<th>Collapse</th>
<th>Consolidation</th>
<th>Cerebral embolism</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold surgical cases</td>
<td>73</td>
<td>18</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Emergency operations</td>
<td>27</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>19</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

Pneumothorax.
This is a fairly common complication of regional analgesia.
Out of 100 patients 19 developed pneumothorax, one after an emergency operation, and 18 after cold surgical operations.

It is not difficult to puncture the lung, when seeking the intercostal space, especially in a thin, restless patient, or in one with pleural adhesions; and though pneumothorax occurred in patients where the pre-operative X-ray examination of the chest was normal, it was more frequent in those where emphysema was present; this suggested that a puncture hole into an emphysematous bulbar, where the lung tissue had lost a good deal of its elasticity, did not close as rapidly as a puncture hole in healthy lung tissue. Oxygen given under pressure, or vigorous coughing on the part of the patient after a lung had been punctured, was responsible for the development of pneumothorax in some cases. After a cold surgical operation performed under regional analgesia, a patient was conscious, felt well, and had no pain for some hours until the action of the local anaesthetic drug had worn off; he therefore coughed more vigorously to clear the secretions from his bronchial tree than a patient who, having undergone an emergency abdominal operation, felt weak, toxic and too indifferent to cough at all.

Collapse.

Collapse of a lower lobe occurred in 8 patients following emergency operations. As these patients would not cough, the bronchial secretions probably collected, and caused collapse of a lobe by blocking a bronchus.

Consolidation.

Consolidation of one lobe occurred in one patient following a hemicolectomy and proved fatal.

Lung Abscess occurred in one patient following a partial gastrectomy. The patient, a healthy male adult, was edentulous, and had no oral sepsis. The pre-operative X-ray examination of chest showed no abnormal condition. During the operation, which lasted 50 minutes, the patient was conscious and gave no cause for anxiety. After operation his temperature became elevated, he developed a troublesome cough, and his sputum became offensive and copious. X-ray examination of chest, 10 days later, showed an abscess in left lower lobe. He was treated and finally recovered.

Cerebral Air Embolism. This occurred in one patient, and
though it is a rare complication it must be regarded as one of the dangers of regional analgesia. The patient, an adult female, suffering from carcinoma of stomach, was admitted for partial gastrectomy: pre-operative X-ray examination of chest showed slight emphysema. The night before operation, as she complained of sleeplessness, she was given gr. iii Luminal. The premedication, omnopon gr. 1/3, was given intravenously 2 hours before operation, and another larger dose was given, also intravenously, immediately before the regional block was started. During the intercostal block the patient was conscious and appeared comfortable, but when the splanchnic block had been done on one side, she became unconscious and deeply cyanised, the pulse volume was good, and rate a little increased. Oxygen was given through a B.L.B. mask; the cyanosis disappeared, but the respiration remained slow and shallow. When her face was touched she developed generalised twitchings which lasted a few seconds. On clinical examination no sign of pneumothorax was detected; the operation was postponed and continuous oxygen administered; after 1½ hours her pulse became weaker, and she was still unconscious. Cardiac puncture was performed and 1.5 c.c. adrenaline was injected into the heart but patient died 2 hours after the initial collapse. As the thoracic block had been completed in 15 minutes it was thought at the time that the maximum narcotic effect of the drugs on the respiratory centre had coincided with the onset of the intercostal paralysis, and had given rise to the respiratory failure. At the postmortem examination made on the fourth day after death it was revealed that death had been due to cerebral air embolism following puncture of the lungs. The lungs on both sides had been punctured in several places and round each puncture was a small area of haemorrhage; it was suggested that air had entered the circulation through the capillaries of the lungs and had caused cerebral air embolism. The heart was normal, no air was present on the left side of the heart, but air was present in right ventricle and pulmonary artery. The reason for this was not explained. However, all the cerebral vessels were full of air.

Conclusions. This series shows a 6 per cent mortality from pulmonary complications following regional analgesia but does not include deaths from other complications.
Pulmonary Complications

Pneumothorax, which is relatively unknown following general anaesthesia or local field block, appears to be a frequent complication following regional analgesia even in the hands of the expert, but it will be seen that this condition does not necessarily prove fatal.

The respiratory depression which often occurs as the result of the temporary paralysis of the intercostal muscles may give rise to imperfect ventilation of the lungs, followed by anoxæmia and temporary failure of the respiratory centre in many instances. Oxygen, administered through a B.L.B. mask, is sufficient to relieve the anoxæmia, but if the respiratory centre has been narcotised with heavy doses of omnopon it may not recover, and anoxia rapidly develops; it is well to remember that the time taken to complete the thoracic block is about 15 minutes, and if omnopon is given intravenously before the start of the block, the onset of the intercostal paralysis will coincide with the maximum narcotic effect of the omnopon on the respiratory centre; this is often the cause of respiratory depression at this stage. When any pulmonary disease is present before operation the paralysis of the intercostal muscles rapidly gives rise to anoxæmia, and the fall of blood pressure which follows the splanchnic block with this technique will cause anoxia, so in these cases oxygen should be administered continuously from the start of the thoracic block until the intercostal paralysis has worn off.

In the light of the present evidence regional analgesia cannot be regarded as the anaesthetic of choice for all upper abdominal operations irrespective of the general physical condition of the patient, for though the abdominal relaxation is unsurpassed by any other form of anaesthesia or analgesia, and the operative shock diminished by the splanchnic block, it has its limitations and dangers, and until such time as statistics showing the incidence of all types of complications following regional analgesia are available, it will not be possible to determine whether or not the advantages outweigh the disadvantages of this technique.

Summary. Pulmonary complications following abdominal operations performed under regional analgesia in 100 cases have been recorded and classified.