PNEUMOTHORAX COMPLICATING BRACHIAL PLEXUS BLOCK ANAESTHESIA

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PNEUMOTHORAX complicating brachial plexus block is one of the known hazards of the technique. The standard textbooks of anaesthetics mention the complication and suggest that it is of infrequent occurrence and of little importance. A review of the literature available to the author confirms its infrequency. Bonica, Moore and Orlov (1949) reported its occurrence on nine occasions in 1,000 blocks. The patients were not distressed and all cleared up in a few days. Bonica and Moore (1950) reported 10 pneumothoraces in a series of 1,512 blocks, and again no patients were distressed except for slight pain on deep inspiration. All recovered within a few days without sequelae. Griswold and Woodson (1943) in a series of 100 blocks had 2 cases of pneumothorax, one being of 25 per cent, and both cleared up without trouble. Patrick (1940) had no cases in a series of 44 blocks, but suggested that the complication must occur. Macintosh and Mushin (1944) in a series of over 400 blocks had 3 pneumothoraces, none of which was serious.

Although the papers mentioned above confirm its infrequency and would appear to confirm its lack of significance when it does happen, Kulenkampff and Persky (1928) and Rhone (1935) both mention a case reported by Capelle (1916) of pneumothorax and severe surgical emphysema following puncture of the lung during brachial plexus block. This patient died as a result of the accident.

The production of a pneumothorax during brachial plexus block is unlikely to be caused by the temporary lodgement of the needle point in the pleural space, particularly when a fine needle is used. Macintosh and Mushin (1944) suggest that the pneumothorax is caused by actual puncture of lung tissue. The small valvular hole so produced results in air entering the pleural cavity on inspiration, with sealing on expiration when the lung collapses. The same authors suggest that minor degrees of pneumothorax may be missed if they occur without obvious symptoms.

Kulenkampff and Persky (1928) drew attention to the fact that an emphysematous lung apex is closer to the brachial plexus than is normal and is more liable to injury during brachial plexus block.

The following two cases, the first of which occurred in the author’s own practice, would appear to be of interest as they illustrate some of the points noted above.

CASE 1

On the evening of 9.9.53 a male patient was admitted with a compound fracture of the prox-
mal phalanx of the middle finger of the right hand. He was to be treated as an out-patient, anaesthesia by brachial plexus block was chosen and this was performed in the following way. The mid-point of the right clavicle was determined, a 3-inch 22 S.W.G. needle was introduced one centimetre above this point just lateral to the external jugular vein, and directed towards the third dorsal vertebra.

The needle failed to contact the first rib and after two or three attempts was re-introduced about one centimetre medial to the external jugular vein. The first rib was located and paraesthesiae elicited. Thirty-five ml. of 2 per cent procaine with 1 in 200,000 adrenaline were injected and a satisfactory block of the right brachial plexus produced. The operation was completed and the patient allowed to return home, having made no complaint during the induction of analgesia or later.

On reporting next morning for a penicillin injection (given routinely to all compound fracture cases) the patient mentioned casually that he had had a small haemoptysis during the night. He had experienced no other respiratory complaint and was not distressed in any way when examined. There was no surgical emphysema at the site of injection. An X-ray (fig. 1) showed a right pneumothorax of about 20 per cent with some collapse of right lung and a slight shift of the heart to the left; there was a small pleural effusion in the right costo-phrenic angle.

As the patient lacked any symptom referable to his pneumothorax and was to receive a course of penicillin, it was decided to let him remain ambulant and to attend daily for review.

Four days later (14.9.53), an X-ray (fig. 2) showed a slight increase of the pneumothorax, the mediastinum still displaced to the left and the pleural effusion had not increased. The patient felt well and was symptom free. The course of penicillin was stopped—1,000,000 units initially followed by 450,000 units daily for 5 days.

The patient continued well and a third X-ray (30.9.53) (fig. 3) showed complete re-expansion of the right lung with resolution of the pleural effusion, the mediastinum now being central.

**Case 2**

A male patient, aged 56 years, was admitted with Dupuytren's Contracture of the right hand. He was suffering from silicosis and chronic emphysema of both lungs. As he was orthopnoeic and was regarded as unfit for general anaesthesia, brachial plexus block was chosen. This was performed on 22.1.53 and shortly afterwards he became considerably distressed by
breathlessness and the operation was abandoned. The patient was returned to bed and was nursed sitting up and given general medical treatment, but his condition, although temporarily improved in the next few days, deteriorated markedly on 27.1.53. On 28.1.53 an X-ray showed a right pneumothorax with collapse of the right lung. General medical treatment was continued till 7.2.53 without improvement in his condition. To relieve the tension pneumothorax a needle was introduced into the pleural space and 900 ml. of air and some effusion were aspirated. The lung almost completely re-expanded and his symptoms were largely relieved. On 16.2.53 it became evident that there was a right basal pneumonia with secondary cardiac failure. With penicillin and medical treatment he gradually recovered and was discharged on 26.2.53.

DISCUSSION

The pneumothorax complicating Case 1 would have been missed but for the slight haemoptysis. This patient at no time complained of any other respiratory symptom, nor did he complain of pain when the anaesthesia was induced and the pneumothorax presumably occurred. The haemoptysis indicates that lung tissue was traumatized and the fact that the pneumothorax increased slightly during the first 4–5 days suggests that the valvular mechanism described by Macintosh and Mushin (1944) was responsible. Sealing of the lung puncture eventually limited the escape of air into the pleural cavity, reabsorption commenced and was complete within 3 weeks without sequelae.

In Case 2 the consequences of the lung puncture were much more serious. This patient had chronic emphysema of both lungs (itself a good indication for the employment of brachial plexus block) and it is likely that an emphysematous bulla was punctured. Such an injury would not seal off as quickly as it would in a normal lung, and as a result this patient suffered from a severe tension pneumothorax with marked respiratory and cardiac embarrassment. The prolonged collapse of the right lung in this case certainly favoured the onset of the pneumonic process which developed later.

In Case 1 the decision was made to treat the patient as an out-patient under surveillance as he showed no respiratory embarrassment. It was thought that his being ambulant would contribute to the re-expansion of the collapsed lung without recourse to physiotherapy and/or withdrawal of the air in the pleural space. The penicillin given for the compound fracture was considered sufficient cover for the small pleural effusion.

CONCLUSIONS

Most pneumothoraces complicating brachial plexus block would appear to clear up quickly without sequelae,
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but should be watched closely till re-expansion of the collapsed lung is complete.

Special care should be exercised in performing brachial plexus block on patients suffering from chronic emphysema of the lungs on account of proximity of the emphysematous lung to the plexus with the possibility of an emphysematous bulla being punctured, an accident which might give rise to a tension pneumothorax. If a tension pneumothorax develops prompt surgical intervention is indicated to reduce the pressure and allow re-expansion of the collapsed lung, so relieving the respiratory and cardiac embarrassment. Re-expansion of the lung should also help to prevent the development of a pneumonic process in the collapsed lobes.

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