A RELIABLE METHOD OF PERFORMING THE PERIDURAL ANALGESIA (P.D.A.)

BY

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The P.D.A. method was for the first time used for the human subject by the Spanish Surgeon, Fidel Pages, in 1920, and later introduced in Italy by Diogliotti and in America for abdominal surgery. It is not generally appreciated by many surgeons because the defective technique frequently impaired the success.

![Diagram of peridural and subarachnoid spaces](image)

**Fig. 1.**—The puncture of the peridural space. The index finger and the thumb of the left hand are leading the needle. The main pressure is carried out by the thumb of the right hand on the withdrawn plunger of the syringe containing saline.

In 1936 a reliable method was elaborated in the surgical division of the University Hospital Erlangen (Germany) by Professor Otto Goetze and his assistant surgeons. Since then the P.D.A. has been used in that University Hospital for all suitable cases, e.g. abdominal and urological surgery as well as for operations on the lower extremity, genital organs and anus.

**Technique** (figs. 1 and 2).—After administration of a common pre-operative drug one hour before the analgesia (scopolamin-ephetonin-eucodal i.v.) a lumbar puncture needle is inserted to about one inch in the same way as for
a lumbar puncture (patient sitting). The stilette is withdrawn and a 10 c.c. syringe with saline connected to the needle. As long as the point of the needle is situated in the dense tissue of the interspinal ligaments a moderate pressure on the plunger does not cause a release of saline, but this stress is adequate to push the needle forward. At the very moment when the tip of the needle enters the peridural space which is occupied by loose areolar tissue, the saline is released and the plunger moves quickly and easily forward. In order to ensure that the subarachnoid space has not been entered, an aspiration test is advisable. An inadvertent puncture of the dura practically never occurs, as the peridural space has a width of about one centimeter, but in case it should happen a higher or lower interspace must be chosen. After this achievement the analgesic solution is injected. The mixture used in Erlangen is: 1 tablet of 0·1 pantocain “Bayer” (syn. amethocaine) is dissolved in 10 c.c. boiling saline; 20 c.c. periston and 6 mins. of adrenaline are added. Periston is a solution with a high molecular gravity used for intravenous infusions. It is added in order to increase the viscosity, which is necessary to prevent the analgesic fluid from spreading into areas where the algesia is not required. Previously 5 per cent gelatine was employed instead of periston but as it cannot be sterilized adequately it was replaced by the latter. At intervals of three minutes three portions of 3 to 5 c.c. are slowly injected. Thus 9 to 15 c.c. of a 0·3 pantocain solution is required for the analgesia, the quantity depends on the general condition and the body-weight of the patient. After the second portion has been administered, the patient is laid on the affected side (stomach on the left, gall-bladder operation on the right side, etc.). About twenty minutes after the last injection the algesia is complete within an area of 2 to 3 segments above and 3 to 4 beneath the level of the site of puncture. It lasts two and a half to three hours.
**CHOICE OF INTERVERTEBRAL SPACE.**

<table>
<thead>
<tr>
<th>Body region</th>
<th>Site of injection</th>
<th>Obtained analgesia</th>
<th>Operation possible on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper abdomen</td>
<td>Between dorsal vertebra (D) 7 and 8</td>
<td>From D. 6 – D.10</td>
<td>Stomach, gall-bladder, etc.</td>
</tr>
<tr>
<td>Middle abdomen</td>
<td>Between D.9 and D.10</td>
<td>From D. 8 – D.12</td>
<td>Transverse colon, kidney and umbilicus, etc.</td>
</tr>
<tr>
<td>Lower abdomen</td>
<td>Between D.11 and D.12</td>
<td>From D.10 – L.3</td>
<td>Appendix, sigmoid and gynaecological, etc.</td>
</tr>
<tr>
<td>Groin region</td>
<td>Between L.1 and L.2</td>
<td>From D.12 – L.4</td>
<td>Hernia, genital organs, etc.</td>
</tr>
<tr>
<td>Lower extremity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) upper leg</td>
<td>Between L.2 and L.3</td>
<td>From L. 1 – L.5</td>
<td>Anterior and lateral parts of thigh</td>
</tr>
<tr>
<td>(b) lower leg</td>
<td>Between L.4 and L.5</td>
<td>From L. 3 – S.2</td>
<td>Lower leg and posterior parts of thigh</td>
</tr>
<tr>
<td>Anal region</td>
<td>Between L.5 and S.1 or from the sacral canal, known as extradural sacral or caudal block</td>
<td>From L. 1 – S.4</td>
<td>Anus and perineum, etc.</td>
</tr>
</tbody>
</table>

For the abdomino-sacral rectum resection two different vertebral interspaces are punctured simultaneously, one between D.11 and D.12 and one between L.5 and S.1. Below the level of L.1 there is a wide distance between the spinal nerve-roots, accordingly an increased spreading of the analgesic fluid is desired and for this reason periston and adrenaline have to be omitted. The periston is substituted by the same amount of saline, in order to maintain the same concentration.

In this hospital 58 P.D.A. were performed within a period of seven months for the following kinds of operations:

- Thoracoplastic ... 1 Removal of semilunar cartilage of knee-joint ... 4
- Stomach resections ... 6 Varicose veins ... 5
- Nephrectomy ... 1 Sciatic nerve suture ... 2
- Laparotomy and colostomy ... 2 Osteotomy on lower extremity ... 4
- Appendicectomy ... 3 Hæmorrhoids ... 2
- Bilateral inguinal hernia ... 22 Urethra plastic and cystostomy ... 1
- Hernia after laparotomy ... 2 Hallux valgus ... 1
- Amputation of lower leg ... 2

For the thoracoplastic 2 L.P. needles were inserted simultaneously, one between D.3 and D.4 and one between D.6 and D.7. The quantity of analgesic mixture injected in each was one third less than used for one puncture.

As the original drugs used in Germany were not available we had to alter the analgesic mixture. At our disposal were novutox and amylocaine. A suitable remedy for increasing the viscosity was dried human plasma from the Army Blood Transfusion Service. At present the following mixture is employed: 40 c.c. of novutox 2 per cent, amylocaine 0·5 per cent, in which 3·5 grammes of dried human plasma is dissolved. 24 to 30 c.c. of this compound is injected in three portions in intervals of three to five minutes. Otherwise the details of
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the method are the same as described. About thirty minutes after the last injection the anaesthesia is complete and it lasts two to two and a half hours. Below the level of L.1, blood plasma is omitted for the same reason as previously mentioned. The results are very satisfactory and post-algesic disturbances have never been observed so far.

The advantages of the P.D.A. compared with the spinal algesia are obvious. It can be confined to the required area of the body on which the performance of an operation is intended. That means less sympathetic fibres are affected and so the fall in blood-pressure is almost non-existent. In case it does occur, mostly by injecting too quickly or due to a poor general condition of the patient, it can easily be dealt with by administration of an analeptic drug, preferably ephedrine subcutaneously. Although the motor fibres are only little affected the abdominal wall is completely relaxed. Post-algesic headache never occurs. A special position of the patient is not required as the fluid with the high viscosity is kept in the areolar tissue. Another safeguard is that the peridural space is confined superiorly at the foramen magnum by the fusion of the dura with the periosteum. For the latter reason the P.D.A. can be practised even in thoracic surgery.

As the drug does not penetrate into the subarachnoid space but only blocks the nerve-roots, the P.D.A. can be considered as a mere regional nerve-block or conduction analgesia. Hence all dangers of the spinal analgesia are excluded while obtaining the same analgesic effect.
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