patient sees the world, and if he utilizes the assets of the personality and the resources of the environment. Alert to the personal factors in the disorders of his adult patients, the practitioner will find attention to them of equal value in his work with children, whose physical symptoms and disorders of conduct are so frequently associated with instinctive factors and personal relations.

To sum up: in the case of each patient, and more obviously in the case of the "nervous" and the "mental" patient, the general practitioner is dealing with a problem of human adaptation. He can deal adequately with this problem only if he is sensitive to the main issues of life, and aware of the complicated forces which are integrated into what is called personality. For this demand on the general practitioner to be met fairly he should have during his medical curriculum a satisfactory opportunity of studying the evolution and organization of human personality, and of making a detailed review of his own personality. How to meet this need is one of the important problems of the medical school of to-day.

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SOME POINTS IN CONNEXION WITH SPINAL ANALGESIA *

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It seems to be generally recognized that the intrathecal injection of even novocain, the least toxic of all the drugs commonly used for the production of spinal analgesia, is sometimes accompanied by unpleasant effects. Typical of these disadvantages are nausea, vomiting, pallor, sweating, slight respiratory embarrassment, and slowing of the pulse. Such unpleasant by-products are usually regarded as being due to the diffusion of the drug throughout the whole of the cerebro-spinal fluid. Thus Klose and Vogt state that this has occurred within half an hour of the anaesthetic being introduced by the lumbar route. An alternative explanation is that these effects are not due to the diffusion of the novocain in the cerebro-spinal fluid, but to its absorption into the blood.

Pitkin proposed to overcome both these difficulties—the diffusion in the cerebro-spinal fluid and the absorption from the cerebro-spinal fluid into the blood—by mixing the novocain with gliadin, an alcohol-soluble protein derivative of wheat starch. In this he has been conspicuously successful. Speaking from the clinical point of view it is unusual to see vomiting or even nausea apart from abdominal manipulation. Pitkin's original solution was lighter than cerebro-spinal fluid. I have had a solution made heavier than the cerebro-spinal fluid, and the result is the same. Apart from abdominal manipulation, nausea and vomiting do not occur. Why? If they occur when novocain alone is used and do not occur when a mixture of gliadin and novocain is used it seems simple logic to conclude that the gliadin has prevented them. Again, if the vomiting is produced by diffusion or absorption, or both—as all agree—then gliadin must prevent diffusion or absorption, or both.

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Anaesthetists experienced in the use of novocain regard 0.12 gram as a maximum dose. Anaesthetists experienced in the use of gliadin-novocain mixtures give two and a half times that amount with impunity. Our critics tell us that with such large doses blood absorption leads to paralysis of the vasomotor centre, low blood pressure, vomiting, and collapse, and that even the respiratory centre may be paralysed by an overdose in the blood.

A case reported by Dr. B. Johnson in the *British Journal of Anaesthesia* (April, 1931), and criticized in the *Lancet* by Dr. Howard Jones and myself, illustrates some of these points. Johnson gave a child of 6 years 200 mg. of novocain in a novocain-gliadin mixture of total bulk 3 c.cm. In six minutes analgesia was as high as the second rib, the carotid could only just be felt, respiration had become jerky, there was extreme pallor of the face and lips, and, in fact, the picture was one of imminent death. The author adds: "Upon tilting the table more head-downwards the patient's condition was rapidly restored to normal." Howard Jones, in criticizing, called attention to the enormous dose, and we should all agree with him that it would seem to have erred on the side of excess; he then adds: "After such a recital is there any need to contest the competence of gliadin to prevent blood absorption?" It is thus evident that he regards all the symptoms that occurred in this case as due to absorption of the novocain into the blood. In his paper, given at Eastbourne last year, though he promised us proofs, he merely restates the position with emphasis. Thus: "The danger is . . . from blood absorption and paralysis of the vasomotor centre, leading in some cases with excessive dosage to severe collapse to a pulseless state."

So much for opinions—now what are the facts? In this case the one relevant fact is that on putting the patient into the Trendelenburg position the condition was rapidly restored to normal. If novocain in the blood supplying the vasomotor and respiratory centres were the cause of the patient's parlous state, it is difficult to see how the Trendelenburg position could affect the matter, for these centres would still be supplied by novocain-containing blood and that more abundantly. It is to me completely convincing evidence that the blood did not contain sufficient novocain to impair the action of either of these centres; that, in fact, there is nothing to be feared from blood absorption.

Some twelve months or so before this case occurred, stimulated by the disagreeable experience of three deaths on the table whilst under spinal analgesia, Dr. Macdonald and I had started some investigations into the action of novocain on the spinal cord of cats. They show that:

1. A full clinical dose of novocain, even if given intracisternally, has no appreciable effect on the vasomotor centre.

2. The cord and spinal roots may be soaked with novocain and, provided the phrenics are not touched, the blood pressure cannot be made to fall to a lower level than 70 to 80 mm. Hg.

3. Abdominal operations usually depress the blood pressure still further. Evisceration, for example, will cause a considerable fall, and the return of the contents to the abdominal cavity is rapidly followed by a welcome rise.

4. Gliadin added to the novocain solution appears to limit the rapidity of diffusion in the cerebro-spinal fluid and slow the rate of absorption from the cerebro-spinal fluid into the blood.

5. Doses of novocain which are clinically effective when injected intrathecally are without appreciable effect when given intravenously, so that the question of blood absorption does not arise.

6. Novocain given intravenously will cause paralysis of the respiratory centre, but it requires something in the neighbourhood of ten times the dose that is sufficient by the intrathecal route. Even with this dose the vasomotor centre is not affected.