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DOES GRANULATION TISSUE IN THE INTERVERTEBRAL DISC PROVOKE LOW BACK PAIN?

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It is difficult to ascribe the origin of low back pain to any specific feature. Factors involved are muscles, ligaments, joints and intervertebral discs which all play a part in the production of pain. Some consternation arose when Key (1945) pronounced that lesions of the intervertebral disc were the most common cause of low back pain. The discussion that followed the publication of his paper in 1945 showed that neither neurosurgeons nor orthopaedic surgeons were apt to accept Key's ideas. But further investigations in this matter have led to a wider recognition of the importance of the intervertebral disc. The work carried out by Lindblom (1951), Hirsch (1948, 1951), Hirsch & Schajowich (1952), Wiberg (1949) and Fernström (1956, 1957) indicates with great accuracy that in most cases of low back pain the intervertebral disc is the cause.

The question then arises what the painprovoking agent in the intervertebral disc is. As early as in 1858 Luschka demonstrated a nerve, the sinuvertebral nerve, which was formed by a cerebrospinal and a sympathetic root. It gives off branches to ligaments, vessels and surfaces of vertebral bodies. These observations were in part confirmed by Hovelacque (1925). The sensory innervation of the posterior part of the spinal column is believed to be furnished by the sinuvertebral nerve (Steindler, 1940, 1947) and low back pain is supposed to be caused by involvement of this nerve (Falconer et al., 1948). Whether this nerve enters the intervertebral disc is, however, a matter of controversy. Wiberg (1949) has been able to trace the nerve to the ligamentous coverings of the disc and so has also Roofe (1940) but on studying the microphotographs the latter has published, it appears as if the sinuvertebral nerve enters into the annulus fibrosus of the disc. Stilwell

(1956) has found the nerve supply to be confined to a thin lamina of loose connective tissue at the surface of the disc. Tsukada (1938) and Ehrenhaft (1943) maintain from their own observations that the annulus fibrosus contains nerve fibres. These investigations have, however, been strongly criticized. Much evidence points to the fact that the annulus fibrosus is devoid of nervous tissue (Jung and Brunschwig, 1932; Pedersen et al., 1956) and the concept is that pain arises from the ligamentous covering of the disc.

In 1952 Hirsch & Schajowich, who had made an extensive investigation of anatomical, pathological and physiological conditions of the intervertebral disc, introduced an interesting idea. He suggested that large rifts in the disc were healed by invasion of reparative tissue from without. An observation of the same kind had been made by Lindblom and Hultquist in 1950. The tissue is highly vascular and regarded as granulation tissue and Hirsch believed that this might "be an important pathological basis for low back pain". The pain is believed to originate from nerves accompanying the blood vessels. Hirsch could not, however, demonstrate any such nerves.

This trend of thought was taken up by us and we examined 122 operated discs (Goldie, 1957) aiming at the discovery of possible granulation tissue and consequently nerve fibres. In 40 discs granulation tissue was observed but no nerves could be identified. Though objections may be raised that a technique has not yet been employed sensitive enough to detect nerve fibres in granulation tissue it cannot be regarded as too brave to refute the theory of low back pain arising from nerves in granulation tissue invading the disc.

TABLE

Correlation of granulation tissue to production of pain in intervertebral discs.

Pain produced by	Granulation tissue	
	present	not present
Palpation of surface of disc	3	3
Curettage	10	64
Palpation and curettage	18	21
No pain	9	41
Total	40	129 = 169

Another reason for doubt regarding this theory are the observations we have made at operation in cases of low back pain. Wiberg (1949)

noted that pain could be elicited by touching the surface of the disc. In cases where he touched the surface of the vertebral body facing the disc with an elevator after having removed the disc prolapse he could produce no pain. He does not mention anything about production of pain whilst working with the instrument in the "disc cavity" proper. We have also found pain to be produced when touching the disc surface. But we have also been able to confirm an observation made by Lindemann and Kuhlendahl (1953). When inserting the conchotome into the cavity we, like the abovementioned authors, have been able to provoke pain while manipulating the instrument in order to exstirpate disc tissue. The patient (operated in local anesthesia) has immediately recognised the pain he has experienced. On touching the cartilaginous plate of the vertebral body no pain has been elicited. The same observations were made by Key in 1945.

An interesting feature is to find out whether there is any correlation between the existence of granulation tissue and the production of pain in discs operated on. At operation in local anesthesia pain has been registered when the surface of the disc has been touched and the cavity curetted. The extracted disc has been microscopically examined for granulation tissue. 169 discs have been examined and in 40 of these granulation tissue has been observed. The table shows the correlation of produced pain to existence of granulation tissue in discs.

From the table it becomes evident that in the majority of cases (88) where pain has been produced no granulation tissue has been observed. Another interesting feature is the great number of cases with pain produced by curettage. This favours the conception of Lindemann, Kuhlendahl and Key. It is, however, surprising that not more patients have felt pain at palpation of the surface of the disc. We have not been able to find a plausible explanation of this.

It has become evident that the origin of low back pain is still difficult to ascribe to one special factor. No doubt the intervertebral disc holds a leading position but we have so far not been able to point to any specific structure in the disc. The invading granulation tissue as a painprovoking agent does not give any satisfying evidence and under these circumstances the theories of the sinuvertebral nerve with its branching are more acceptable.

SUMMARY

Pain has been elicited by instrumental provocation in 169 lumbar discs. The disc material has been microscopically examined with the

purpose of investigating the presence of granulation tissue. It was thereby noted that pain could be provoked from discs whether granulation tissue was present or not. This has led us to believe that granulation tissue in ruptured discs cannot be regarded as the painprovoking agent in low back pain.

RESUME

La douleur a été obtenue par provocation instrumentale dans 169 disques lombaires. Des prélèvements de disques ont été examinés au microscope dans le but de déceler la présence de tissu de granulation. Il a été observé que la douleur pouvait être provoquée dans ces disques, qu'il y ait du tissu de granulation ou non. Cela nous a amenés à croire que les tissus de granulation dans les ruptures de disques ne peuvent pas être considérés comme l'agent provocateur de douleurs dans les cas où il y a des douleurs dans la partie inférieure du dos.

ZUSAMMENFASSUNG

Schmerzen wurden mittels instrumenteller Reize bei 169 lumbalen Zwischenwirbelscheiben hervorgerufen. Das Scheibenmaterial wurde mikroskopisch mit der Absicht, die Gegenwart von Granulationsgewebe festzustellen, untersucht. Es wurde dabei bemerkt, dass Schmerzen sowohl bei Scheiben mit als auch ohne Granulationsgewebe hervorgerufen werden konnten. Diese Tatsache führte dazu, dass wir annehmen, dass das Granulationsgewebe der gesprengten Scheibe nicht die Ursache der Schmerzen sein kann.

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