treatment of these and other infective and pyogenic conditions.

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LOW BACKACHE AND SCIATICA.*

BY

W. A. COCHRANE, F.R.C.S.Ed.,
Assistant Surgeon, Royal Infirmary, Edinburgh.

THIS paper represents an attempt to discuss the painful "low back" from the orthopaedic standpoint. It may occur with or without sciatica, and, for the sake of clearness, the writer proposes to discuss the pathogenesis of the sciatica in a separate section.

In cases of backache and sciatica a careful eliminative diagnosis leaves a large group which is essentially orthopaedic. It includes the industrial lame backs—a large and important element of industrial accident cases. In one large works back strains and injuries of this type are responsible for 20 per cent. of all accidents.

Cases of low backache and sciatica are full of interest and importance because of their frequency, of the lack of accurate diagnosis and classification, and of the difficulty in some cases of disproving the assertion of pain. We have to investigate, first, as to whether pain really exists, and second, as to the traumatic element in the lesion which is discovered. Let the writer begin by emphasizing the great importance of a routine method of examination in these cases. The physical examination of the painful back is a painstaking and meticulous performance, which cannot be learnt without study. Superficial examination will entirely fail to bring out the points on which the real scientific analysis of these cases depends. Next in importance is the necessary knowledge of anatomy and statics of the body as a whole and of the parts concerned, which can interpret the findings intelligently. The detail of the step-by-step procedure advisable in such cases has been well described by Osgood and Morrison.¹ Suffice it to say that, if completely carried out and interpreted in accordance with anatomical fact and functional use of the body, it will go far to improve upon the standard of knowledge and treatment which commonly exists to-day. The writer would submit that it has been due to the fundamental work of the Boston school of orthopaedic surgeons, and particularly to Goldthwait, that the whole subject has become clarified. This is a great and enduring achievement.

In this country we have been apt to regard this whole field as unknown—the happy hunting ground of the quack, by whatever name he may be called. Fortunately, indications are not lacking that greater interest is being taken in the subject of backache and sciatica. In this connexion the Lady Jones Lecture of 1927, delivered by Putti, upon the pathogenesis of sciatica, may be cited as an example, and a vast bibliography has grown up.

It seems to the writer that general discussion of the subject may well be centred round the following: (1) the main problems; (2) special points and methods of diagnosis; (3) a suitable clinical classification; (4) methods of treatment.

THE MAIN PROBLEMS.

1. The first problem is in regard to the anatomical type of the individual concerned, for special consideration has to be paid to the slender, tall and lanky, or small and delicate type of patient. These individuals are especially unsuited to heavy work and, even under ordinary conditions of life, they are subject to functional breakdown in regard to the back. The spine is slender, hypermobile, and wand-like. There is a true, inherent weakness, and it most commonly betrays itself in general postural strain, or in symptoms of strain referred to the sacro-iliac joint.

2. The second problem concerns cases of backache, with or without sciatica, in individuals who use the body in poor posture and in positions of mechanical disadvantage. With incorrect bodily mechanics, all the antero-posterior curves of the spine are increased, and the joints are used at their extreme limit of motion. The normal balancing mechanism of the body is impaired and the load is borne by bony and ligamentous supports. The lumbo-sacral joints in particular are overloaded in heavy subjects with prominent sagging abdomens, and a chronic lumbo-sacral strain commonly results.

The other part of the "low back" which is exposed to static insult from this source is the sacro-iliac joint. The pelvis being tilted forwards, the support of the joints becomes less efficient. The muscular support of the pelvis, which Goldthwait has shown is so important in the support of these true articulations, becomes impaired. The sacrum may be regarded as a see-saw swung on a transverse axis passing through the sacro-iliac joints. The shorter upper arm is weighted by the body, which tends to thrust it downward and forward. If the individual is bending and lifting a heavy load, and the load slips, a severe stretching of the sacro-iliac ligaments can, and does, take place. Pain is experienced over the joint, and the clinical features are quite definite. Leverage in the opposite direction through the hamstrings is also effective in straining the joint. Post-operative backache is due to a sacro-iliac strain from insufficient support of the lumbar region. The faulty statics may be due to a short leg, flat-foot, or an affection of the hip.

3. The next problem arises when x rays reveal no intrinsic lesion of the lumbo-sacro-iliac region. As Osgood and Morrison point out, the need for accurate diagnosis in these cases is acute. Our first object should be to demonstrate the presence or absence of persisting strains. It should be stated that a negative x-ray photograph is not sufficient to warrant the assumption that there is nothing the matter with the patient. In point of fact, careful reading of good radiographs will frequently reveal a departure from the normal in many cases of extrinsic lesions. For example, ossification of the iliac attachment of the ilio-lumbar ligament is always due to lumbo-sacral strain of long duration. The more the subject is studied, the more is one impressed by the help which good stereoscopic and lateral x-ray photographs are in support of a routine and systematic examination.

4. Next is the discovery in the radiograph of an intrinsic lesion of the spine, such as osteo-arthritis, in cases of alleged injury. The symptoms are usually out of all proportion to the severity of the trauma. This furnishes the main class of case for medico-legal battles. Compression fractures of the spine sometimes follow comparatively minor violence, and represent the most commonly overlooked industrial lesion. It is remarkable how frequently a lesion of the spine is overlooked in the antero-posterior view radiograph, to be shown quite clearly in the lateral view.

5. The problem which next merits attention is the difficult and complex question of the relationship of anatomical variations of the fifth lumbar vertebra to backache and sciatica. One would refer particularly to semi-sacralization, variation in the shape and direction of the articular facets, and to spina bifida occulta.

What is the connexion between these variations and backache and sciatica? Is the association casual or causal?

* Read in opening a discussion in the Section of Orthopaedics of the Annual Meeting of the British Medical Association, Cardiff, 1928.

These abnormalities have existed long before symptoms of pain in the back began. When any considerable departure from the normal exists, however, a careful history will often reveal that the patient has had periodic attacks of pain. These backs are apt to be intermittently symptomatic. As Osgood puts it, the abnormality is to be regarded as potentially contributory. These backs are more easily strained than the normal. It is unquestionable that the connexion between the occurrence and persistence of symptoms and the presence of these abnormalities is an intimate one. O'Reilly's² large series of anatomic variations indicates that 50 per cent. had back symptoms of varying severity. Poor posture, injury, and advancing age combine to make the abnormality manifest itself, and the chain is complete.

6. In cases of injury the most difficult problem is the mental one. Conn³ has pointed out that the traumatic back still enjoys an unenviable notoriety as a rock-bound refuge for malingerers. The reputation is not always merited. Malingerers are met with, but they are not common. One factor worth remembering is that the workman is often genuinely deceived as to the true sequence of events which have led up to his disability. A second factor is that the man realizes that he has little to show for his symptoms and is apt, therefore, to exaggerate. He feels that the onus of proof rests with him.

DIAGNOSIS.

The differentiation of the various types of backache is always difficult and can be made only after the elimination of definite intrinsic pathological lesions of the bones and joints—such as tuberculosis, syphilis, arthritis, osteomyelitis, neoplasm, spondylolisthesis, and fracture.

The chief points to be noted are the general build and attitude of the patient, the presence or absence of the normal lumbar curve, of listing or lateral deviation of the spine; restricted and painful movements of the spine and hips in standing, sitting, and lying; spasm or wasting of the muscles; swelling and points of tenderness over the lumbo-sacro-iliac regions; rectal examination; and the nerve function in the legs.

In addition to the ordinary x-ray photographs stereoscopic views should be taken which include the symphysis pubis. Lateral views of the spine should also always be taken.

CLINICAL CLASSIFICATION.

The following may be accepted as a suitable clinical classification: (1) Acute traumatic strain. (2) General postural strain. (3) Lumbo-sacral strain. (4) Sacro-iliac strain. (5) Combined pelvic joint strain.

1. Acute Traumatic Strain.

This lesion represents a rupture of ligamentous and muscular fibres, with all the phenomena of acute injury. The connexion between trauma and violent effort and the sudden development of symptoms is always definite. A lesion in the muscle gives rise to pain when the muscle is thrown into action; a lesion in fibrous tissue when the fibrous tissue is put upon the stretch; a lesion of bone or joint on all movements of the spine. There is acute tenderness on pressure, localized over the site of the lesion. From its location, and from analysis of the spinal movements which are most painful, a fair idea of the structures involved may be obtained. The treatment of a torn muscle must be to rest it until healing has taken place. Most of these cases in industrial back-accident cases are allowed to use the muscles too soon and with insufficient protection. If there is a superadded infective focus present in the body—whether in teeth, tonsils, or alimentary tract—there is reason to suppose that this may be a potent factor in keeping up the disability. When the disability has become chronic, it is due, in large part, to the perpetuation of the protective response of the muscles to prevent motion of the spine. Such fixation is crippling, and manipulation under an anaesthetic is then advisable.

To secure the required rest the patient should be made recumbent on a firm mattress, and should have the back splinted with adhesive strapping. The knees should be supported on a pillow. In severe cases, a plaster-of-Paris jacket should be employed or recumbency in a plaster shell.

The patient is then allowed up and given heat, massage, and graduated exercises. If handled properly the condition of acute traumatic strain is curable in a short period of time, and the multitude of such cases which are allowed to go about with chronic disability and incapacity for work represents, in some measure, a reproach to us. Stress must again be laid upon the fundamental factor of poor bodily mechanics and posture as tending to perpetuate the disability, and the necessity for physical education to eliminate it.

While complete rest is advisable for a torn muscle or aponeurosis, a sprained joint should be made active as soon as possible, and correction of the poor general statics enforced.

2. General Postural Strain.

In this case the condition is one of general muscular fatigue and ligamentous strain, and is not confined to any one joint. The complaint is of dull aching in the shoulders and low back, coming on when the patient is tired, and relieved by rest. The patients are of the slender asthenic type, and investigation may show that they are engaged in occupations which are unusually fatiguing, or which favour the adoption of faulty attitudes. There is usually no referred pain in the leg. Examination shows poor posture. There is no limitation of motion in the spine or in the hips, and muscle spasm is absent. Treatment is by rest, support, and postural re-education.

3. Lumbo-sacral Strain.

The pain, dull or acute, is localized in an indefinite way over the lower spine and hip, affecting chiefly one side, or in other cases being referred quite definitely to the lumbo-sacral angle; it is usually asymmetrical, and sciatica is a frequent symptom. This kind of backache is generally relieved by rest. One outstanding type is seen in the stout person with heavy, protruding abdomen. In order to accommodate the increased weight in front, the patient tilts the spine backwards, with the production of excessive lordosis. The body weight is taken upon the spinal arches, the impinging spinous processes (they are seen faceted in a radiogram), and upon the locked-home lumbo-sacral articulations. Examination shows bad posture. Spinal movements are usually fairly free, but on lateral bending the participation of the lower lumbar vertebrae in the movement is often greater in one direction than the other. Forward bending is limited by spasm of the hamstring muscles, limiting the flexion of the pelvis on the hips. There is local tenderness on deep pressure in the lumbo-sacral region over the articulations, or further out at the attachment of the ilio-lumbar ligaments to the iliac crests. The hip motions are free, but flexion of the hip with the knee extended ("straight-leg raising") is limited on the affected side. Nerve examination may show disturbance of cutaneous sensibility and muscular atrophy in the lower limb of the same side.

The treatment is as under the previous section. The patient is made recumbent on a hard mattress with a pillow beneath the knees. He is rolled over, on to the face thrice daily for three-quarters of an hour, and hot fomentations are applied. When the soreness has gone out of the back he is instructed in a lying-down list of exercises, with a view to educating him in flattening the lumbar spine. He is allowed up in a plaster jacket, or in a brace which spans the lumbar curve and helps his muscles in attaining the correct position for the spine, which they are taught to do by postural training. When he understands the elements of proper bodily mechanics, the brace is gradually discarded. In women a carefully fitted corset is worn over the brace.

4. Sacro-iliac Strain.

In contrast to lumbo-sacral strain, which usually affects the heavy type of person and is relieved by recumbency, sacro-iliac strain is commonest in the slender, visceroptotic type, which uses the body in poor posture. The back becomes lordotic; the ligaments gradually stretch out and, in exceptional cases, a minor displacement may take place, the upper part of the sacrum moving forward. Positive evidence of this may sometimes be discovered in the fact that the posterior superior iliac spines are on slightly different levels; also, in asymmetry at the symphysis pubis.

as seen in an x-ray photograph. The so-called subluxation of the sacro-iliac joint occurs, but it is rare. Sacro-iliac joint strain is, however, common.

In acute injuries of the healthy joint the posterior ligaments prevent forward dislocation of the upper part of the sacrum. When the body weight is bent forward and the lifting of a heavy weight is started, the back muscles contract, fixing the spine. The iliac part of the gluteus maximus and the hamstrings become taut to fix the pelvis, and the only muscle free to act is the sacral division of the gluteus maximus. This violently pulls the lower part of the sacrum forward, shearing the joint surfaces, and a true synovitis results (Luskin⁴). There is present a flat back, scoliosis, tenderness over the joint, and hamstring spasm. Sometimes violent leverage is exerted upon the joint through the hamstring muscles.

The joint is supplied by the lumbo-sacral cord, the first and second sacral nerves, and the superior gluteal nerve. Referred pain is usually along the first and second sacral nerves—posterior aspect of thigh—to outer side of leg and ankle. Because of the nerve supply of the superior gluteal, pain is referred to the sacro-sciatic notch and extends antero-laterally towards the anterior iliac spine. The tender spots in traumatic or inflammatory conditions of the sacro-iliac joint are:

1. The inferior sacro-iliac ligament, between the posterior and inferior iliac spines.
2. Sacro-sciatic notch.
3. Sometimes the sciatic nerve trunk.

Motions.

Standing.—In forward bending the lumbar spine is flexed. Then the pelvis is tilted forwards until the hamstrings are taut. At this point the patient has to flex the knee of the affected side. In lumbo-sacral conditions the lumbo-sacral region is kept rigid, and forward bending takes place at the hip-joints.

Sitting.—In sitting the hamstrings are relaxed and consequently the patient can bend forward more easily. In lumbo-sacral conditions the movement is just as limited as in standing.

Lying.—If both hips are flexed with the knees bent, in lumbo-sacral conditions, there is still pain and limitation of movement as soon as the pelvis begins to be flexed upon the lumbar spine. In sacro-iliac conditions no leverage is exerted and the movement is free. If, however, the limb on the affected side is raised with the knee extended, the hamstrings become taut and leverage is exerted on the sacro-iliac joint; pain is experienced over the joint. Similarly, if the same test is tried with the other limb, pain is frequently experienced over the sacro-iliac joint of the side opposite to that of the raised limb.

The description of the diagnostic points given largely follows that of Smith-Petersen,⁵ who has based his account of the clinical features upon fifty cases—thirty of strain and twenty of inflammatory conditions—confirmed by operation to produce ankylosis of the joint.

Treatment.

The treatment of sacro-iliac strain is by rest and support, with heat and massage later, followed by education of the muscles to flatten the lumbar spine and to undo the abnormal forward tilting of the pelvis. Most of the mild cases are relieved by strapping, but more commonly a light brace and well-made corset are required for a time.

In the more resistant cases the joint must be manipulated under an anaesthetic. The assistant fixes the pelvis; the surgeon flexes the affected limb, with the knee extended to the right-angled position, until the hamstrings are felt to give. In still more resistant cases Smith-Petersen's operation to ankylose the joint may be required.

5. Combined Pelvic Joint Strain.

Clinical features referable to both lumbo-sacral and sacro-iliac joints may be found together; this occurs sometimes in semi-sacralization of the fifth lumbar vertebra. In one specimen bony ankylosis had taken place in the accessory articulation, and in the sacro-iliac joint of the same side, from arthritis. Presumably the patient must have had

severe symptoms for years—to obtain relief when ankylosis occurred. An enlarged fifth lumbar transverse process giving rise to local and referred pain usually responds to conservative treatment by prolonged immobilization and support. Removal by operation has often been practised with good effects in the resistant type of case. An alternative and a better plan is to ankylose the lumbo-sacral region by a fusion or bone-grafting operation.

A NOTE ON THE PATHOGENESIS OF IDIOPATHIC SCIATICA.

A mass of reliable evidence is now available to prove that the cause of many cases of sciatica is to be traced to an anatomical abnormality or lesion in the lumbo-sacral region of the spine. The diagnostic features indicate a lesion of the joint by localized pain and tenderness on deep pressure, by asymmetrical immobility of the spine—sciatic scoliosis—and by pain referred along the sciatic nerve. Whilst the nerve itself may occasionally be tender, it is commonly not so in such cases. Goldthwait of Boston was the first to investigate the problem from the anatomical and mechanical aspects, with the result that painful semi-sacralization of the fifth lumbar vertebra is now a well-recognized entity. There is irritation of the sciatic nerve, combined with protective deviation of the spine from the vertical in a direction away from the enlarged transverse process. This deformity of the spine may simply be attitudinal and protective, as when no actual accessory articulation exists. When a very large unilateral sacralization exists it may cause a simple, fixed scoliosis without very obvious muscle-spasm. Deep-seated tenderness, best elicited when the patient is kneeling, can be discovered to be present over the accessory articulation, and not over the lumbo-sacral articulations.

Discussing the mechanical factor present in referred sciatic pain in cases of unilateral enlargement of the fifth lumbar transverse process, Bauman⁶ regards the distinct forward bulge of the process as a definite factor in producing overstretching of the lumbo-sacral cord. He was impressed by this in the thirty-five cases operated upon for the relief of the sciatica by removal of the process. Almost every one of these cases was permanently successful. Many other similar cases are reported in the literature.

Putti⁷ regards many of the cases of sciatica as a neuralgia, caused by pathological conditions of the intervertebral foramina, and especially of the intervertebral articulations. The common cause is chronic arthritis.

He calls attention to that part of the nerve trunk which occupies the intervertebral foramen, the funicular portion of the nerve, lying between the spinal root and the plexus. The foramen is a fibro-osseous canal, bounded posteriorly by the articular facets. The foramen between the fifth lumbar vertebra and the sacrum is the smallest, and the size increases from below upwards in the lumbar region. Quite contrary to the size of the foramen is the size of the enclosed lumbar nerves. The fifth lumbar root is the largest, and the others diminish from below upwards. In point of fact, the fifth root completely fills up the canal and is in very close relationship to the intervertebral disc, so that displacement of the body of the fifth lumbar vertebra, as in spondylolisthesis, may easily compress this trunk. The blood vessels are especially prominent as a plexus in the foramen, so that congestion of the vessels, as in a chill or rheumatism, may affect the contained nerve.

The size of the foramen is alterable by movements of the spine. In poor posture associated with increased lumbar lordosis, the available room for the fifth and, to a lesser extent, the fourth lumbar nerve may be seriously diminished. If, in addition, there is a sudden hyper-extension injury, it is not difficult to understand that a synovitis of the joint may affect the nerve lying in front. And so with chronic arthritis of the lumbar joints. This condition can be discovered even in the early stages by good radiographs; it is not uncommon in cases of chronic lumbo-sacral strain associated with sciatica.

Abnormalities of the facets are not unusual. Instead of being crescentic, one or both of the lumbo-sacral facets may be flat, and may occupy the coronal plane. If this is associated with other abnormalities of the fifth lumbar vertebra, such as semi-sacralization, and with increased lumbar lordosis from poor posture, the room available

within the related foramen may be so seriously lessened as to set up sciatic pain.

In these cases the maximum tenderness is over the affected articulation, and protective sciatic scoliosis is usually present. Treatment must be by prolonged recumbency and immobilization of the spine, if necessary in a plaster shell, combined with hyperaemia. In the convalescent stage a supportive brace must be worn and postural re-education begun. In one resistant case Putti resected the diseased posterior articulations, with good effects.

CONCLUSIONS.

Cases of low backache and sciatica form a distinct orthopaedic group. They are capable of definite scientific analysis and classification.

To study them intelligently requires an appreciation of certain main problems which are indicated. The factors of trauma, anatomical type, good and bad posture, of anatomical variations, and of pathological lesions of the spine are all concerned in what is really a combination problem.

To make our diagnosis more accurate a routine and systematic method of physical examination is required.

Skilled interpretation of good x-ray photographs, by those familiar with the clinical picture, is the most valuable accessory aid in support of the diagnosis made by the history and examination.

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PERFORATED DUODENAL ULCER SIMULATING ACUTE APPENDICITIS.

BY

K. C. L. PADDLE, M.C., M.R.C.S., L.R.C.P., D.P.M.,
SENIOR ASSISTANT MEDICAL OFFICER, WEST RIDING MENTAL HOSPITAL,
WAKEFIELD.

CASES of perforated duodenal ulcer simulating appendicitis in normal people are, I believe, comparatively common. The symptoms presented in such cases are usually so urgent that there is no difficulty in making a diagnosis. Those who have seen the acute abdomen in the insane, however, will no doubt agree that there is a real difficulty in making up our minds that there is anything urgent and requiring immediate attention. Yet, if a waiting policy is adopted, the consequences are usually disastrous. The following case presents unusual features of interest.

The patient, a man aged 36, was admitted to this institution on October 26th, 1921, suffering from dementia praecox. He was dull and sullen, never speaking voluntarily or taking any interest in his surroundings whatever. He was quite unemployable, and was occasionally impulsive and destructive. He suffered from an intractable form of impetigo, but was otherwise in quite good bodily health.

On May 13th last he vomited once, just before being put to bed at 10 p.m. His temperature, pulse, and respirations were normal at the time, and he did not complain of pain, and looked quite well. He got up next morning at 7.30, apparently quite well, had breakfast at 8, and vomited soon after. His pulse, temperature, and respirations were normal. He was, however, put to bed for safety, though he looked well and did not complain. At 1 p.m., five hours later, his pulse rate had risen to 102 and his temperature to 101° F. He then looked ill. He lay absolutely still on his back with his right leg slightly drawn up. His tongue was dry and furred, respirations about 22, but his abdomen moved fairly well rhythmically. On examination there was some rigidity of the abdominal muscles on both sides, but nothing marked. There was no superficial tenderness, but the patient resented deep palpation of the right iliac fossa, though he did not seem to mind deep palpation of the left side. The heart and lungs were normal; the urine also was normal. He would not reply to questions as to his condition and gave little help. He, however, undoubtedly suffered from an acute abdomen; a provisional diagnosis of acute appendicitis was made, and the patient was hurried to the operating theatre.

Operation.—A right paramedian incision was made, the right rectus being drawn inwards. The peritoneum was incised and was found to be acutely inflamed. A lot of dirty-looking non-purulent

fluid exuded. After careful separation of recent adhesions between coils of small intestine the appendix was isolated and, except for the general peritonitis present, was found to be quite normal. It was removed. The original incision was next prolonged upward for about two inches, and the right side of the abdomen explored. A lot of the turbid fluid was tracking downwards, and on exposing the duodenum (second part) a fairly large perforation was found with prolapsed mucous membrane showing. There was little induration round the perforation, which admitted the tip of the middle finger easily. It seemed to be of the nature of an acute duodenal ulcer. A purse-string suture was inserted round the perforation and the ulcer buried. The right side of the abdomen was next irrigated with warm normal saline and drainage tubes were placed in the lower part of the wound to drain the pelvis, and also tubes were inserted in the right lumbar region through an incision in the right flank.

The patient made an excellent recovery. Ten days later, however, he commenced vomiting during the night, and right up till noon next day, when the vomited matter became faecal. All food was stopped and the patient only allowed to drink the following:

R. Sod. bicarb.	1 part
Mag. carb. pond.	2 parts
Calc. carb.	2 "
Bismuth oxycarb.	4 "
Water q.s. to a cream consistency.	

Sig: 3i in 3iv water every two hours.

Vomiting ceased two hours after taking the first dose, and from that time onwards the patient made an uninterrupted recovery, his abdominal wound healing up by granulation.

The points to remember in this case are:

1. The perforation took place at least some eighteen hours before operation, probably soon before 10 o'clock the night previously, when he vomited for the first time.
2. There were no constitutional disturbances until after breakfast next morning at 8 o'clock, and then only very little after that.
3. The great difficulty in diagnosis owing to the patient's mental condition and lack of positive symptoms.
4. The threshold for pain in this case was very much lowered.
5. The importance of eliminating acute disease in the patient's other systems, such as respiratory, vascular, and urinary.
6. The usefulness of an alkaline bismuth mixture in relieving high intestinal obstruction, due to oedema of mucous membrane at the site of an ulcer.

I am greatly indebted to the medical director, Professor J. Shaw Bolton, for his able guidance during the operation and for kind permission to publish details of this case.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

A PLASTIC PROCEDURE IN THE MASTOID OPERATION.

SEVERAL methods are in vogue for obtaining an epithelial flap or flaps in the radical and conservative mastoid operations which, although in practice they appear sound on theoretical grounds, are not infrequently disappointing. In both these operations I have employed the following simple procedure with gratifying results.

The posterior cartilaginous wall of the meatus is separated from the corresponding bony portion, and the cartilage is transfixed by a flap-knife or tenotome at the upper end of the junction between the external auditory meatus and the concha, and divided vertically along this line through a length corresponding to the vertical diameter of the meatus. From the upper end of this incision another is carried inwards at right angles through the whole width of the cartilaginous meatus, a rectangular flap being thereby obtained with its base attached to the inferior wall of the cartilaginous meatus. The cartilage included in the flap is excised.

The flap is now held aside by tissue-forceps until the "bone-work" of the operation is completed. This done, a small crescent is excised from the inner cut edge of the concha to produce a large meatal orifice. The flap is next turned down on the lower wall of the operation cavity and its outer edge sutured to the skin edge of the lower part of the inner semicircular conchal margin, sufficient of this having been removed by the crescentic excision to make room for the edge of the flap without kinking it. The deeper part of the flap is maintained in position by wool or gauze packing until it has become united by granulation tissue to the inner wall of the operation cavity; when this occurs packing may be dispensed with. The discharge is gently mopped away and the walls of the cavity are treated twice daily with a stimulating lotion such as lotio rubra; hydrogen peroxide should not be used, since it tends to undermine the flap.