OPERATIVE TREATMENT OF OSTEOARTHRITIS OF THE HIP

BY

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At the end of the war the operative treatment of degenerative arthritis of the hip at this hospital was largely confined to three common procedures. Arthrodesis of the affected joint was regarded as the operation of choice in the younger group of patients, particularly when the condition was unilateral. Where mobility of the hip was required simple excision of the femoral head and neck, with the production of a pseudarthrosis as recommended by Girdlestone in 1938 (quoted by Batchelor, 1948), had a limited popularity. One of the major criticisms of this operation was the instability which followed, and the osteotomy practised by Batchelor (1948) appeared to have the advantage of additional stability, though probably requiring a rather longer period of convalescence. At this time the intertrochanteric osteotomy described by McMurray (1939) was not widely practised.

A new stimulus to the surgery of the hip was produced by the painstaking work of Smith-Petersen (1939, 1948) in the production of the mould arthroplasty. The operation that was finally devised appeared to have great advantages over the older methods of fascial arthroplasty, and revived interest in this country in the production of a stable, mobile, and painless joint. The shape of the Smith-Petersen vitallium cup was later modified by Adams (1953), who produced two models, the first in acrylic resin and the second in vitallium. One of the disadvantages of the Smith-Petersen arthroplasty was found to be the long period of rehabilitation demanded by the new hip-joint, and the more rapid results which Judet and Judet (1950) showed were seized upon with some enthusiasm. Unfortunately the early results of this operation were not maintained, and the use of a prosthesis of this type has largely been abandoned.

Many reviews of the results of hip surgery have been devoted to an assessment of the value of a single procedure. In this unit most of the common operations upon the osteoarthritic hip have been performed, and it appeared that a long-term survey of the results was due. With this in mind the present investigation was undertaken.

Material

During the ten-year period 1947 to 1956, 290 operations were performed in the orthopaedic unit at Guy's Hospital for degenerative arthritis of the hip. The types of operation are indicated in Table I.

The number of patients subjected to operation was 239. Many of these required more than one operation

TABLE I.—Types of Operation Performed

Type of Operation	No. Performed	No. Reviewed
Arthrodesis { Watson-Jones ..	90	54
{ Britain ..	12	7
Cup arthroplasty ..	72	30
Replacement arthroplasty (Judet) ..	46	28
Girdlestone's pseudarthrosis ..	25	6
Batchelor's pseudarthrosis ..	20	13
McMurray's osteotomy ..	15	10
Other operations ..	10	6
Total ..	290	154

upon the hip, and in some both hips were treated. The difficulties of tracing and persuading these patients, many of whom were very elderly, to come for review were great. Some had died during the intervening years, many lived too far away or were too old, and some had moved away and could not be found. Those who were examined formed just over half the total, and were probably a reasonably representative group. Of the rest, there were a large number who replied to a postal questionnaire, the results of which tend to confirm those obtained from personal examination, though they are not in fact included in this review.

Eight patients did not leave hospital after operation, and the cause of death in these was pulmonary embolism in four, massive collapse of lungs in one, cerebral haemorrhage in one, cardiac failure in one, and post-operative shock in one. Though this indicates a mortality ratio of almost 3%, there have been no deaths after operations upon the osteoarthritic hip during the past five years.

In comparing the results of various operations upon the hip it is important to consider what influenced the choice of surgical procedure. Table II is thus of interest,

TABLE II.—Analysis of Type of Operation and Year

	Arthrodesis	Cup Arthroplasty	Judet	Pseudarthrosis	Other Operations
1947	3	1		1	1
1948	3	4		5	2
1949	4	10		7	
1950	7	10		6	2
1951	9	12	32	2	3
1952	11	11	14	3	2
1953	18	16		7	5
1954	20	7		9	2
1955	13	0		3	3
1956	14	1		2	5
Total	102	72	46	45	25

as it shows the popularity of operation year by year. Clearly, the condition of the patients coming for treatment has varied much less than the fashion for a particular surgical procedure. The patient who was suitable for a cup arthroplasty in 1948 was equally suitable for a replacement arthroplasty in 1952. Certain operations, however, have tended to be regarded as salvage procedures, and have been performed upon the more disabled patient, often as a secondary procedure. This type of selection must have some influence upon the result.

Method of Assessment

The two major symptoms of these patients are pain in the hip and limitation of physical activities. The latter is largely a function of pain, but fixed joint deformities also play a part. These symptoms were classified in the following way:

Pain.—0 = None at any time. 1 = Slight pain on activity. 2 = Considerable pain on activity, little at rest. 3 = Severe pain night and day, usually requiring analgesics.

Limitation of Activity.—0 = Full activity. 1 = Unessential activities avoided. 2 = All activities curtailed, difficulty in walking. 3 = Confined to the house.

From the pre-operative records, aided by the patient's own memory, an analysis of pain in the back and both hips, the limitation of activity, and the range of joint movement was compiled. For the post-operative assessment these features were supplemented by a record of the gait, the range of knee and spinal movements,

and a clinical estimation of the length of the legs. At the conclusion of the examination both hips were radiographed. The appraisal of the operations has been made largely upon the relief of pain, the restoration of activity, and, to a limited extent, the range of joint movements. The more detailed systems of assessment described by Gade (1947) and by Shepherd (1954a) have not been used, largely because of their complexity. It has been found that the following standard expresses in general terms what the surgeon and the patient feel about the results of an arthroplasty. (Clearly an arthrodesis must be assessed on a slightly different basis.) Good: complete relief of pain, with retention of a useful range of movement. Fair: result impaired by residual pain, stiffness of the hip, or instability. Poor: no relief.

The description of hip movements also needs some elaboration. The range of movements permitted often varies from day to day, and an accurate assessment is of little value. In using flexion of the hip as an index of mobility the most easily measured direction of movement has been taken. This is probably also the most important, though a small range of abduction is of great value. In very general terms the retention of other movements has been in proportion to the range of flexion remaining.

Arthrodesis

During the period under review 102 patients were subjected to arthrodesis of the hip. In those patients in whom degenerative changes followed tuberculosis of the hip in childhood Brittain's arthrodesis was performed. In some cases this was modified by using the fibula as a graft, immediately above the osteotomy site. These patients were immobilized in a plaster spica for 12 to 16 weeks.

When the degenerative changes were not infective in origin the arthrodesis was performed in the way which has been described by Watson-Jones and Robinson (1956). The hip was exposed by modified Smith-Petersen incision and the head of the femur dislocated. After removal of articular cartilage from the acetabulum and the head of the femur, the joint was transfixed by a long trifin nail. The arthrodesis was usually reinforced with a small graft cut from the ilium and slotted into the femoral head. Bone chips from the same source were placed around the joint. In the course of the operation only one major difficulty was noted—that of secure fixation of the two bones. In some cases the nail failed to penetrate the acetabulum adequately and the head of the femur sprang back, leaving a considerable gap between the two bones. This difficulty tended to arise in younger patients where the acetabulum was unduly dense, but in no case did it necessitate the abandoning of internal fixation. At the conclusion of the operation some patients were left lying free in bed, others had a short hip spica applied, but the majority were immobilized in a single hip spica for a period of about 10 weeks.

Results of Operation

As the object of these procedures was to secure bony ankylosis of the hip, the condition of this joint has been critically examined. The hip was considered to be arthrodesed when no movement could be detected at the joint and when the radiographs showed bony trabeculation passing from the femur to the ilium. The results are indicated in Table III.

The number of patients subjected to ischio-femoral arthrodesis is too small to be of much significance. Two

TABLE III.—*Arthrodesis of the Hip*

		Total No. of Hips	Bony Ankylosis
Brittain	Following tuberculosis	5	5
	arthroplasty	2	0
Watson-Jones		54	36

patients who failed to attend are known to have required further operations upon the hip, and presumably, therefore, bony fusion was not achieved. The two failures after arthroplasty confirm that arthrodesis as a secondary procedure is difficult and rarely successful.

As a result of the Watson-Jones procedure, only two-thirds of these patients secured bony fusion. Most of the rest had a short fibrous ankylosis in which movement was just detectable, but occasionally the range of movement was considerable. The rates of fusion after this type of arthrodesis have been variously reported. Thus Brown (1954), reviewing 31 hips from the same department treated surgically during the period 1942–6, found fusion in 27. Watson-Jones and Robinson (1956) in a personal series of 120 cases found all but seven had fused by bone. The surgical technique was similar, though the post-operative period of immobilization was longer and much stricter, and four patients required a second operation.

In reviewing the results of hip arthrodesis Stinchfield and Cavallaro (1950) found a pseudarthrosis rate of 23%, while Apley and Denham (1955) considered that fusion of the hip occurred in only 13 out of 20 patients in whom arthrodesis was attempted without osteotomy. These figures relate to the work of more than one surgeon, and the rate of fusion will always be found to be higher (as it is in the present series) with a single operator of wide experience.

In an attempt to discover the patients in whom pseudoarthrosis was most common, the rate of fusion according to age has been considered, and is presented in Fig. 1. Up to the age of 50 only three hips of 19 failed to unite by bone. Above this age the fusion rate declined sharply, and over the age of 60, only 8 out of 20 hips showed a bony ankylosis. It is therefore suggested that the apparent deterioration in the rate of fusion, in this unit at least, lies in the increasing age of the patients who have been selected for this operation.

FIG. 1.—Effect of age upon fusion. Over the age of 60 the fusion rate in arthrodesis of the hip declines sharply.

FIG. 2.—Results of hip arthrodesis. A bony fusion is associated with complete relief of pain; fibrous union may be painless, but more commonly gives rise to hip discomfort.

The object of arthrodesis is to relieve hip pain, and, as Fig. 2 shows, this was achieved in about three-quarters of the patients. The presence of a bony ankylosis was always associated with complete relief of hip pain, unless there was some reaction around the pin, which occasionally required removal. A short fibrous ankylosis was compatible with almost complete relief of pain, and indeed it is surprising how few of these patients admitted to more than an occasional discomfort in the hip. However, the pain in seven patients was considerable, and four of these required a further operation.

Assessment of function after the operation was complicated by the increasing age of the patient, and sometimes by the presence of degenerative changes in the other hip. However, most of the younger patients were able to engage in heavy work. In the more elderly the arthrodesis undoubtedly presented difficulties which are often ignored in the assessment of their disability. Though all were grateful for the relief of pain, some had difficulty in dressing, and many could not get up stairs. Some found it difficult to keep themselves clean at toilet. These difficulties appeared to be greater in patients with a relatively mobile hip pre-operatively than in those in whom the pre-operative range of movement was small.

Complications

Stiffness of the knee after immobilization in plaster was not seen during this series, and every patient had a range of movement of more than 90 degrees of flexion. On the other hand, degenerative changes in this joint were common, particularly when it had previously been the site of a long-standing osteoarthritis. To some extent this was influenced by the position of the arthrodesed hip. Any internal rotation deformity at the hip undoubtedly added to knee strain.

The optimum position of arthrodesis of the hip varied from patient to patient. Excessive internal rotation produced an unsightly gait. The neutral or mild external rotation position caused no disability, and external rotation had to be gross before it interfered with walking. Variations in the degree of abduction of the femur on the pelvis appeared of little importance, though the adducted position gave a slightly better gait. The greatest problems in walking were seen in patients with varying degrees of flexion deformity. It is notoriously difficult to assess the position of the hip on the operating-table, and this accounts for the wide range of positions which were seen. The gait was best in patients in whom the leg was fixed in the extended position, but for the older patients sitting was easier with a flexion deformity. When this exceeded 30 degrees, however, progression without a stick was impossible. For the most part excessive flexion was seen in patients with a failure of bony union, and a progressive flexion deformity even in the absence of pain was undoubtedly a severe disability.

Fracture of the femur at the level of insertion of the pin occurred in five patients. This was the most common, and the most serious, of the later complications. These fractures often occurred from trivial violence, but appear to unite readily. The incidence of fracture (10%) is higher than in most reported series; indeed, this is a complication which is frequently not mentioned.

One of the most encouraging features of this group is the response of the contralateral hip to arthrodesis. When the degenerative changes were initially unilateral

they remained so. When the second hip was already deteriorating, a successful arthrodesis on one side usually enabled the patient to carry on without undue difficulty, and none of these patients subsequently required surgical treatment of the second hip. A study of the changes in the range of movement of the second hip, and of the radiographs, indicates that deterioration during the period of observation has only been slight.

It is now generally agreed that back pain after arthrodesis is not a significant problem provided the lumbar spine is relatively normal pre-operatively. The present review has confirmed this. Indeed, most of the patients with pre-operative back discomfort found that this was alleviated by arthrodesis of the hip.

McMurray's Osteotomy

Intertrochanteric osteotomy was performed upon 10 patients. In three of these the osteotomy was used to correct deformity of a hip which was already ankylosed, either by fibrous tissue or by bone. The seven cases which remain for consideration are too few to merit detailed analysis. The result was good in three, fair in three, and bad in one. The latter required further surgery.

From a more extensive and more recent experience of this operation it is clear that complete relief of pain can be expected in perhaps two-thirds of patients, usually with retention of a reasonable range of hip movement. Much difficulty has been experienced with delay in union of the osteotomy. Occasionally it may never unite, though it may not give rise to symptoms. Indeed, the patient with the best result in the small group reviewed above showed no evidence of union of the osteotomy. This is a complication which is not mentioned in the reviews of Osborne and Fahrni (1950), Wardle (1955), and Adam and Spence (1958).

Acrylic Replacement of the Femoral Head

This operation was performed only during 1951 and 1952, and 46 hips were so treated. The 28 hip-joints which were re-examined appeared to give a reasonable indication of the results of the operations. Many of the other patients have replied to a letter, and some have stated that the joint is still satisfactory.

The review of these patients now covers a period of about six years, and the results are indicated briefly

FIG. 3.—Results of acrylic prosthesis. On the left is shown the number of prostheses remaining in the hip at varying periods after the initial operation. Against those on the right are charted the results of the operation.

in Fig. 3. As time has passed there has been a steady diminution of the number of prostheses remaining in position and giving satisfactory service. Each year one or more of these patients require removal of the acrylic head.

At the present time five patients with unilateral operations retain a good result. These patients have a good range of hip movement, some of them walk without a stick, and none has any pain. There are six others who still appear to be better than pre-operatively, but all complain of pain and some have an unstable hip. The patients with a bad result are more disabled than they were pre-operatively: many of them require removal of the prosthesis, but are understandably reluctant to undergo further surgery. Regardless of the clinical condition of the hip, the radiographs all show gross erosion and ballooning of the acetabulum, often with necrosis of the neck of the femur and subluxation of the hip-joint.

It is unfortunate that there is no detailed information either of the state of the prostheses which were removed at operation or of the histological changes taking place around the hip-joint in those patients requiring further surgery. Indeed, the failure of the Judet prostheses has been considered by only one author (Pridie, 1955), and an analysis of the factors which have led to its disuse would clearly be of value. In view of the amount of fibrosis which forms around these hips it would appear that simple removal of the acrylic head with trimming of the neck might be sufficient to give some relief of pain with relative stability of the hip.

Cup Arthroplasty

Only 30 of the 72 cup arthroplasties performed during the years under review were available for re-examination. The type of mould used and the subsequent fate of the patients are indicated in Table IV.

TABLE IV.—Cup Arthroplasty

	Smith-Petersen	Crawford Adams	
		Acrylic	Metal
Good	6	2	
Fair	7	3	
Bad { <i>In situ</i> ..	3	2	1
Bad { <i>Removed</i> ..	4	1	2
Total	20	8	3

Though a small number of these patients have presented at a later date with symptoms severe enough for further surgery to be required, revision has been necessary only during the first year or two after operation. Thus the general impression is gained that this is the operation which will stand the test of time and in which late deterioration is unlikely to occur.

The good results with the Smith-Petersen cups are very impressive but quite unpredictable. There seems to be no way in which the results of these operations can be forecast. Roughly one-third will be expected to be good, one-third to be fair, and one-third to be bad; the results therefore fall in line with the much larger series analysed by Shepherd (1954b). The amount of flexion in these patients was 90+ degrees in seven, 60+ degrees in six, and 30+ degrees in three. Most of them retained a very useful range of hip movement, but in only three was this greater than the pre-operative level. Within this series at least, the operation has tended to retain the range of movement rather than to increase it. To some extent this must be due to the pre-operative selection of patients.

The two cups designed by Crawford Adams were used in 11 hips. The reaction of the hip to the presence of the acrylic concentric cup was very similar to its reaction to the Judet prostheses. The somewhat better results obtained with the cup are probably only due to its simplicity. The metal concentric cup was used on only three occasions; two of these had to be removed and the end-result in the third was bad. In the one specimen available for examination the cup had fractured.

Pseudarthrosis

In contrast to the other operative procedures, pseudarthrosis has been used in only a small group of patients who were considered unsuitable for the more ambitious reconstructions, and as a salvage procedure in the arthroplasty which had failed. These patients thus tend to form a selected group. In most of them the pseudarthrosis was supplemented by a subtrochanteric osteotomy. The numbers of patients involved are too small to show how the osteotomy influences the late results of a pseudarthrosis.

In the classification of the results of the pseudarthrosis a distinction has been drawn between operations performed as a primary or a secondary procedure. The results are shown in Table V.

TABLE V.—Results of Pseudarthrosis

	Primary	Secondary
Good	6	2
Fair	1	4
Bad	0	6

TABLE VI.—Relief of Pain by Pseudarthrosis

	Painful	Pain-free
Primary	6	1
Secondary	10	2

It is clear that there is a considerable difference between the results in these two groups. If the relief of pain alone is taken as a criterion of a successful operation the results are very similar (Table VI).

In some of these patients, however, the relief of pain was of secondary importance to the retention or the restitution of hip movements: the range of post-operative flexion was 90+ degrees in four, 60+ degrees in eight, 30+ degrees in five, and none in two.

The range of movements in these patients is not significantly different from those which have followed arthroplasty. After a pseudarthrosis, however, active hip flexion is usually lost, and some difficulty in lifting the leg may therefore be experienced. Some patients have found difficulty in driving a car. The shortening of the leg and the instability are usually minor difficulties which the patients rapidly accept, but most of them use a stick when walking out of doors.

Other Operations

Under this heading the following operations have been recorded: replacement arthroplasty (Stamm 3 and Moore 1), 4; Stamm acetabuloplasty, 1; and cheilotomy, 1.

Of the Stamm replacement arthroplasties, two became painful and the prosthesis was removed, and one remains in position with a relatively pain-free joint but some instability. The Moore arthroplasty is painful, with a small range of movement. The patient with the acetabuloplasty has a small range of hip movement but a little pain. The result of the cheilotomy is

disappointing, and the hip shows the changes of avascular necrosis. These cases are too few to merit more detailed consideration.

Secondary Operations

Revision has occasionally been necessary after all procedures except McMurray's osteotomy (recent experience has shown that this operation is not immune from complications). The results of these procedures are indicated in Table VII. The analysis has been

TABLE VII.—*Results of Revision Procedure*

Primary Operation	Revision	No. of Cases	Improved	Unchanged	Worse
Arthrodesis	Rearthrodesis	1		1	
	McMurray's osteotomy	2	1	1	
Pseudarthrosis	Pseudarthrosis	1			1
	Trimming femoral stump	2	2		
Cup arthroplasty	Arthrodesis	1		1	
	Pseudarthrosis	4	1	3	
Acrylic prostheses	Pseudarthrosis	8	5	2	1
	Arthrodesis	1		1	
Metal prostheses	Pseudarthrosis	1	1		

limited to a simple determination of whether improvement or deterioration has followed the second operation.

From a limited experience of revision procedures, and also from a review of the disabilities occasioned by the failure to gain relief from a primary operation, the following general principles emerge.

Arthrodesis.—The pain and disability of a fibrous rather than a bony ankylosis are rarely severe enough to justify further operative procedures, particularly as these carry little chance of relieving symptoms. When the patient is young rearthrodesis may be attempted. This, however, is the age at which non-union is rare. In the elderly the problem of non-union is more common, but the prospect of achieving bony ankylosis by a second operation is correspondingly more slender.

Pseudarthrosis.—Relief of pain has been achieved in two patients by simple refashioning of the bone ends. This is a simple manœuvre—the period in hospital need only be short—and perhaps it deserves a wider application.

Arthroplasty.—Whatever type of arthroplasty has been performed, revision demands the removal of the prosthesis. These patients are often severely disabled, and Girdlestone's operation may relieve their pain. To supplement the operation by an osteotomy makes it a more lengthy procedure without adding materially to the final stability. Many of these patients have already developed what is effectively a pseudarthrosis from acetabular absorption, and are therefore adapted to the loss of hip stability.

It would appear that arthrodesis of the hip is rarely achieved after an arthroplasty has failed. In the younger patient, however, this might well be the procedure of choice.

Bilateral Arthritis of the Hips

Clinical and radiological evidence of involvement of both hips in an arthritic process does not necessarily indicate that both require surgical treatment. Indeed, if the more severely affected hip can be treated to provide a strong, painless leg, the other hip may be spared. It is generally thought that this can best be achieved by an arthrodesis.

When both hips have required treatment, either initially or during the follow-up period, a number of combinations of operations have been performed. The results of these procedures have already been recorded in discussing the fate of individual hips, and the final effect on the patient has therefore been assessed only in very general terms (Table VIII).

TABLE VIII.—*Bilateral Operations*

	Good	Fair	Bad
Arthrodesis and cup arthroplasty ..	1	0	2
" " pseudarthrosis ..	1	0	0
Bilateral acrylic prosthesis ..	0	2	3
McMurray's osteotomy and pseudarthrosis ..	0	0	1
Acrylic prosthesis and pseudarthrosis ..	0	0	1
Cup arthroplasty and acrylic prosthesis ..	1	0	0
Bilateral cup arthroplasty ..	0	0	1
Total	3	2	8

It is probable that this is an unrepresentative series of patients. From the correspondence with those who failed to attend, the impression has been formed that very few patients with severe bilateral arthritis of the hips have gained relief. It is thus of the greatest importance to preserve the function of the second hip. That this may be done by arthrodesis of the more affected side has already been noted. Where surgical treatment of one hip has been unsuccessful the other hip will often deteriorate. Even a hip which was normal before its fellow was subjected to operation may show gross signs of degenerative arthritis within a few years.

Conclusions

In the treatment of the osteoarthritic hip arthrodesis remains the procedure of choice. Though bony fusion may be achieved in only two-thirds of the patients, pain from a fibrous ankylosis is rarely severe. In the young patient a stiff hip is a trivial disability ; in the elderly it is more serious, and is occasionally a great handicap. Where relief of pain is complete it is acceptable ; where a stiff hip is associated with a painful fibrous union the level of activity is often low. Over the age of 60 bony fusion has occurred in fewer than half the patients, and when to the risks of non-union are added the hazards of fracture of the femur the disadvantages of this operation in the elderly appear to be substantial. There is thus every justification for the search for a more acceptable procedure.

Cup-arthroplasty has given a measure of relief to patients with unilateral osteoarthritis of the hip, though the results, at least in terms of relief of pain, have been greatly inferior to those of arthrodesis. Nevertheless, there is a place for an operation which will retain mobility, particularly in the second hip, and in the elderly. It is unfortunate that these patients are frequently unable to manage the intensive and often lengthy period of rehabilitation which this operation demands.

The intertrochanteric osteotomy of McMurray probably offers a better chance of retaining a mobile, painless hip than any arthroplasty. Unfortunately the painful hip with a good range of movement is rarely seen. By the time the patient is sufficiently disabled to accept a period of three months or more in hospital the hip is usually stiff. Similar difficulties arise in its application to the problem of the second hip. Many of these patients manage for many years with an arthrodesis on one side; by the time the other hip requires operative treatment it is usually too stiff to respond to the osteotomy.

The value of the pseudarthrosis, apart from its place after a prosthesis which has failed, lies in the retention of a reasonable range of movement with some relief of pain. It must be accepted that neither of these is certain—indeed, perhaps no more certain than in a cup arthroplasty. Nevertheless, the retention of hip

movements depends less upon the active efforts of the patient, and it is therefore more suitable in the elderly. The results of the operation might be better if it were not so commonly applied to the grossly disabled patient.

None of these operations will enable a patient to escape from hospital much before three months have elapsed. In the elderly, time is of the greatest importance, and any procedure which entails a shorter stay in hospital demands consideration. This is the merit of the replacement arthroplasty. It must be accepted, however, that no prosthetic replacement of the femoral head in the arthritic hip has yet been shown to give a durable, stable, painless joint. To some extent this must be due to a failure of materials and design. Mere replacement of the femoral head, however, cannot be expected to relieve all pain and restore all movement. It may, however, provide an acceptable compromise between the disadvantages of the stiff hip and the perils of the formal arthroplasty.

These patients were under the care of Mr. J. S. Batchelor and Mr. T. T. Stamm. It is a pleasure to express my gratitude to them.

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GERIATRIC SURGICAL EMERGENCY

BY

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In general, geriatric medicine may be regarded as embracing all patients over 50 years (Thewlis, 1946), but the major problems of surgical management in the geriatric patient are not seen with any frequency until a much greater age. By the age of 70, however, few patients fail to show unmistakable signs of physical or mental degeneration. It was therefore decided to review all the patients of 70 years and over admitted as emergency cases to a single surgical unit over a period of four years. It is not suggested that there is any essential pathological difference between the surgical diseases of patients under and over 70, but the treatment of these diseases in the aged often calls for some modification of standard practice, and geriatric surgery resolves itself into a series of compromises between the optimum surgical treatment required by the disease and the needs of a patient whose capacity to withstand treatment is rapidly diminishing. To emphasize this aspect of the management of the geriatric surgical emergency, a system of classification has been used which compares the programme of treatment provided for the patient with that which would have been offered to a fit man of 50 years with comparable pathological condition.

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Classification

Group 1: Optimum Management.—*a*, No operative treatment required. *b*, Full optimum operative treatment provided.

Group 2: Compromise Management.—*a*, Emergency surgery not required. Unfit for desirable elective surgery. *b*, Emergency or palliative surgery provided. Unfit for desirable elective surgery. *c*, Emergency or palliative surgery provided. Lesion otherwise inoperable by ordinary surgical standards.

Group 3: Unsatisfactory Management.—Unfit for emergency or palliative surgery.

Present Series

During the four-year period from August, 1954, to August, 1958, 408 patients of 70 years or over were admitted as emergency cases to a unit of 70 beds, or were transferred to it as emergencies from medical beds. The details are summarized in Table I. It will be seen

TABLE I.—Summary of Whole Series of 408 Cases

Group	No. of Cases	Male	Female	Deaths		Average Age in Years	Average Days in Hospital	No of Cases with Medical Complications
				No.	%			
Misdiagnoses ..	35	24	11	7	20	77	12	—
Strangulated hernia ..	73	38	35	9	12	79	12	28
Malignant obstruction ..	23	13	10	11	48	73	28	8
Simple ..	20	10	10	6	30	78	21	7
Appendicitis ..	29	12	17	6	21	77	23	11
Diverticulitis ..	16	10	6	1	6	72	19	4
Biliary disease ..	37	17	20	5	14	77	13	15
Perforated peptic ulcer ..	8	6	2	2	25	86	27	5
Other gastric lesions ..	16	7	9	4	25	77	26	5
Pancreatitis ..	6	3	3	2	33	73	10	1
Retention of urine ..	118	118	0	34	29	77	32	70
Vascular lesions ..	10	6	4	8	80	77	13	5
Miscellaneous ..	17	10	7	9	53	75	14	7
Total (excl. 35 misdiagnoses) ..	373	250	123	97	25	77	22	166 (45%)

Total number of operations = 185. Operative deaths = 54 (29%).

that a group of 35 cases is described as misdiagnoses and is excluded from the total analysis. These cases were admitted with a surgical diagnosis but subsequently proved to have no surgical disease and were either discharged or transferred to medical units. Of these 35 patients, 8 were admitted for intestinal obstruction but were proved to have constipation or faecal impaction, 3 were sent in for retention of urine because of the oliguria of congestive cardiac failure, 12 diagnosed as cases of perforated peptic ulcers had either coronary occlusions or exacerbations of peptic ulcers, while the remainder included such diverse conditions as retention of urine in a woman with diabetic polyneuritis, a myeloid leukaemia with abdominal pain, a case of Paget's disease of bone, and a patient with an aneurysm of the thoracic aorta. The mortality of this group during an average stay of 12 days was 20%, making an interesting comparison with the surgical conditions summarized in the rest of Table I.

A few other general comments are necessary. The ratio of 250 male cases to 123 female almost exactly reflects the proportion of 2 male beds to 1 female bed which exists in this unit. The male predominance was due almost entirely to cases of urinary retention, so that in other sections of the table the sex incidence is probably a reasonably accurate reflection of the natural ratio for the disease concerned. The deaths were those occurring in hospital from any cause, and, while it was