THE CANADIAN MEDICAL ASSOCIATION JOURNAL

LE JOURNAL DE L'ASSOCIATION MÉDICALE CANADIENNE

Volume 101 • Number 2 • July 26, 1969

Low Back Pain in Men Receiving Workmen's Compensation: A Follow-up Study

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THE results of non-operative treatment of low back pain in some patients in the Workmen's Compensation Board (W.C.B.) Hospital and Rehabilitation Centre, Downsview, Ontario, were reported in a previous communication.[1] These patients, however, were not representative of all those receiving compensation for low back pain. They were members of a very special group because they had not recovered and returned to work within six weeks of injury as 90% or more of such patients do.[2] Before admission to the Centre all had had some form of treatment but without satisfactory relief from the complaint. Although a high proportion had been under the care of medical doctors, about 10% had been treated by chiropractors; the results were no better. All had later been admitted to this Centre, where further treatment was given and results were studied as previously reported.

W.C.B. records of a patient's progress are discontinued when compensation payments cease, so little was known of the late effects of the condition requiring treatment in these patients. In the hope that useful knowledge could be obtained it was decided to study these patients further and to determine the effect of their compensative condition on their ability to work over the longest period of time possible after discharge from this Centre.

Materials and Methods

We have studied the progress of the individuals included in the previous report[1] as well as other similar patients who had been admitted to this Centre, all of whom fulfilled the following criteria:

(1) The diagnosis, made in each case by a team consisting of a neurologist and an orthopedic surgeon, was "discogenic low back pain", i.e., disabling low back pain which had resulted from trauma to a degenerated intervertebral disc in the lower lumbar spine.

(2) The man's claim had been accepted by the Workmen's Compensation Board of Ontario.

(3) The condition had been present less than 12 months but more than six weeks.

(4) No operation had been performed, and none seemed indicated.

(5) The patient was over 19 but not over 60 years of age.

Each patient was interviewed at six-month intervals by a vocational rehabilitation officer from the Compensation Board, using a standard questionnaire; therefore the same information regarding working ability, symptoms and treatment was sought from each patient.

The classification of the state of the back condition on the basis of the man's ability to work was the same as previously used (Table I).

Of the original 700 patients observed and assessed twice a year, 132 were lost to follow-up before the end of four years for several reasons—change of address and inability to trace them, removal to another province, or death. Because of this rate of loss we decided that to continue observation would be relatively unrewarding after the end of four years from discharge. The total number we succeeded in following up for this period was 568, of whom 444 had had only conservative treatment.

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TABLE I.—CRITERIA USED FOR CLASSIFYING STATUS OF BACK CONDITION

Clinical Status			
Satisfactory		*Unsatisfactory*	
Excellent	*Good*	*Fair*	*Poor*
1. Working full time at pre-accident job *or* 2. By own statement is able for 1 (above)	1. Working at pre-accident job but with up to 20% time loss *or* 2. Working at modified job with no time loss *or* 3. By own statement is able for 1 or 2 (above) but not more	1. Working at pre-accident job but with 20-50% time loss *or* 2. Working at modified job with up to 20% time loss *or* 3. By own statement is able for 1 or 2 (above) but not more	1. Working at pre-accident job with more than 50% time loss *or* 2. Working at modified job with 20-50% time loss *or* 3. By own statement is able for 1 or 2 (above) or for less

Note: All limitations of ability to work are caused by "low back" symptoms.

RESULTS OF CONSERVATIVE (NON-OPERATIVE) TREATMENT

Of the 444 patients treated without operation, 178 (40%) had been classified as "satisfactory" and 266 (60%) as "unsatisfactory" at the time of their discharge from this Centre. A considerable change in status occurred annually (Table II). While there was little change in the proportion rated "satisfactory" in the final two years of the follow-up, there was an appreciable alteration in the status of individuals (Fig. 1). In fact, 146 or nearly 33% changed their status once or more during the second, third and fourth years. However, of the 340 whose status was "satisfactory" at the end of the second year, 87% (296) remained so to the end of the fourth year. This suggests that a patient of this type who can achieve "satisfactory" work status by the end of two years is likely to continue satisfactorily for at least a further two years.

TABLE II.—PROPORTION OF "SATISFACTORY" AND "UNSATISFACTORY" CONSERVATIVELY TREATED PATIENTS AT END OF EACH YEAR OF FOLLOW-UP

			%
On discharge	Satisfactory	178	40
	Unsatisfactory	266	60
One year	Satisfactory	297	67
	Unsatisfactory	147	33
Two years	Satisfactory	340	76.5
	Unsatisfactory	104	23.5
Three years	Satisfactory	349	78.6
	Unsatisfactory	95	21.4
Four years	Satisfactory	332	75
	Unsatisfactory	112	25

A further finding, perhaps more unexpected, is that the achievement of "satisfactory" status was not influenced by radiological evidence of congenital or developmental abnormality, degenerative change or instability of low lumbar spine.

We looked for a possible relationship between some personal factors and achievement of "satisfactory" status at work (Table III). The

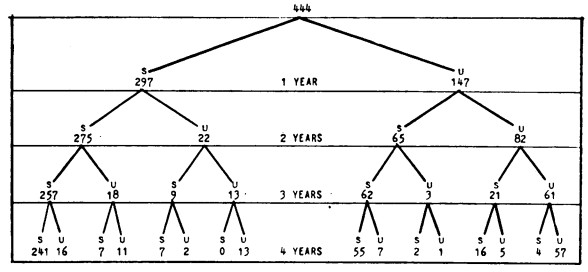

Fig. 1.—Schematic representation of distribution of "satisfactory" (S) and "unsatisfactory" (U), conservatively treated patients, at end of each year of follow-up. It indicates the numbers in whom status was maintained and the numbers in whom it changed. For the latter group, it shows the frequency and time of the change and whether there was an improvement in condition or a recurrence of disability. "Satisfactory" at discharge—178 (40.0%); "satisfactory" at 1 year—297 (67.0%); "satisfactory" at 2 years—340 (76.5%); "satisfactory" at 3 years—349 (78.6%); "satisfactory" at 4 years—332 (75.0%).

proportion achieving "satisfactory" status was unaffected by occupation, whether the man was a construction labourer, a truck driver, a miner, or worked at some other job. Age is seen to have little influence on progress.

Nizan[3] has found that country of origin of disabled workers in Israel did have an appreciable effect on the rate of their return to work. Also locally there has been a rather wide belief that certain groups of foreign-born patients react badly to and are very difficult to treat for low back pain. Thus it was obviously desirable to test the validity of such opinion. The Italian-born were the only group sufficiently large to warrant comparison with those born in Canada. We compared these two groups with all the other foreign-born patients, and it is clear that country of birth does not affect prognosis, the rate of attainment of "satisfactory" status being statistically the same in all three groups.

In a group of 126 of these patients we collected information concerning seniority on the job, length of time from accident to admission to the Centre, abnormal objective neurological findings suggesting a nerve root lesion, history of previous episode of low back pain, and ability

TABLE III.—RELATIONSHIP OF OCCUPATION, COUNTRY OF BIRTH AND AGE TO RECOVERY OF "SATISFACTORY" ABILITY TO WORK, IN CONSERVATIVELY TREATED PATIENTS

Category	*444 patients*	*296 Satisfactory*	*Percentage of group*	*148 Unsatisfactory*	*Percentage of group*
OCCUPATION:					
Construction worker..	149	95	63.5	54	36.5
Truck driver	46	35	76.0	11	24.0
Miner.....	28	22	78.5	6	21.5
Other.....	221	144	65.0	77	35.0
ORIGIN:					
Italy.....	131	82	62.5	49	37.5
Canada...	187	136	73.0	51	27.0
Other.....	126	78	62.0	48	38.0
AGE:					
19 to 29...	84	61	73.0	23	27.0
30 to 39...	176	125	71.0	51	29.0
40 to 49...	129	84	65.0	45	35.0
50 to 60...	55	26	47.0	29	53.0
19 to 39...	260	186	71.5	74	28.5
40 to 60...	184	110	60.0	74	40.0

Note: "Satisfactory" in this table includes all those who became so within two years of discharge from this Centre and remained so until the end of four years.
"Unsatisfactory" includes all who were discharged so and were unimproved two years later.

to communicate in English. Again there was no significant evidence that these factors influenced the prognosis.

"Satisfactory" status did not necessarily mean freedom from pain. Of 74 patients who had maintained "satisfactory" status during the final two years of observation, 60% or more had pain which in their opinion required professional or home treatment or both.

RESULTS IN PATIENTS TREATED BY OPERATION

Of 568 patients followed up for four years after discharge from this Centre, 124 were operated upon during this period. Five were lost to follow-up within two years of operation. Of the remainder, six had an exploratory laminectomy only, 35 had laminectomy and discectomy, 60 had laminectomy, discectomy and fusion, and 18 had spinal fusion only. About half of these procedures were carried out within six months of discharge.

These operations were performed by a number of surgeons not connected with the W.C.B. organization. The indications for operation were not available to us. The surgical explorations, however, did give us an opportunity to test the accuracy of the clinical diagnosis made by our diagnostic teams in this Centre, as well as that of the radiological diagnosis by myelography and discography, as reported by outside radiologists.

Diagnosis of sciatica due to involvement of a nerve root was made by our diagnostic teams in 70 patients who later were subjected to laminectomy. The diagnosis was confirmed in 56 (80%). No definite cause for nerve-root pain was found in the other 14, though this does not necessarily disprove the diagnosis.

Myelography and discography were used in a number of patients. Table IV lists these and shows the relationship of their interpretation by the radiologist to the findings reported by various surgeons at operation. The readings were confirmed in 84% of myelograms and in 88% of technically acceptable discograms.

TABLE IV.—RELIABILITY OF MYELOGRAPHY AND DISCOGRAPHY AS SHOWN AT OPERATION

Myelograms (before first operation)	
Total number with adequate reports	89
Correct	75
False positive (including three wrong levels)	5
False negative	9
Discograms	
Total number with adequate reports	25
Correct	22
Incorrect	3

Operations of various types were performed on a total of 119 patients who were followed up for a minimum of two years. Of these 105 were followed up for three years and 82 for four years after the final operative procedure (Fig. 2).

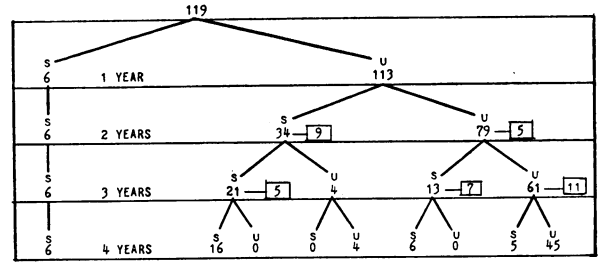

Fig. 2.—Distribution of "satisfactory" (S) and "unsatisfactory" (U) patients at end of each year of post-operative follow-up. Observed 1 year 119: "satisfactory" 6 (5.0%); observed 2 years 119: "satisfactory" 40 (33.6%); observed 3 years 105: "satisfactory" 40 (38.0%); observed 4 years 82: "satisfactory" 33 (40.0%).
NOTE: All patients operated upon and followed up two years' minimum to four years' maximum.
□—Indicates number of patients not followed up after this time.

It is seen that 21 patients had "satisfactory" status when lost to follow-up less than four years after operation. Two of these had been rated as having no permanent disability and 19 had been awarded a permanent disability pension.

Sixteen patients were lost to follow-up while still "unsatisfactory" less than four years after operation. Fourteen of these had been awarded a permanent disability pension and two probably will not be allowed one.

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Almost all patients treated by operation who became "satisfactory" by the end of two years remained so, at least for a further two years.

One hundred and fifty-seven operations were performed on 119 patients. Twenty-seven had two operations each, four had three and one had four.

The rate of success for surgical operations of all types was between 30 and 40%.

Exploratory laminectomy was carried out on six patients in the belief that an intervertebral disc herniation was present, but none was found and discectomy was not done. All six were "unsatisfactory" four years later. Three were considered to have post-accident neurosis.

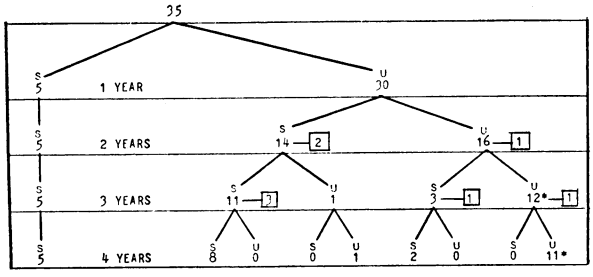

Fig. 3.—Distribution of "satisfactory" (S) and "unsatisfactory" (U) patients at end of each year after laminectomy and discectomy. Observed 1 year 35: "satisfactory"—5 (14%); observed 2 years 35: "satisfactory"—19 (54%); observed 3 years 32: "satisfactory"—19 (60%); observed 4 years 27: "satisfactory"—15 (55%).
*—Includes one patient who had two discectomies, one year apart.
□—Indicates number of patients not followed up after this time.

Laminectomy with discectomy was performed on 35 patients (Fig. 3). In one the procedure was repeated. Most of those who became "satisfactory" required between one and two years to do so, but having achieved "satisfactory" status they tended to maintain it. The success rate for this operation in this group of patients was about 55%.

Discectomy and fusion was done on 60 patients (Fig. 4). Seventeen of these 60 patients had become "satisfactory" two years after operation, and even after a further two years only one-third of those followed up that far had achieved this status.

That the rate of success was not appreciably different whether the procedure was done at one or multiple levels or whether at a single or two separate operations is shown by the following findings.

Thirty had discectomy followed by fusion from fourth lumbar to sacrum. Only 14 became "satisfactory" and required between two and four years to reach this stage.

Fifteen patients had a discectomy as a primary procedure followed by fusion at one, two

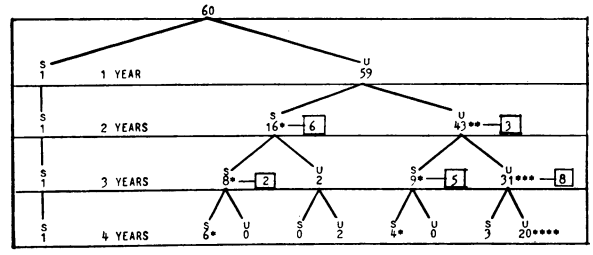

Fig. 4.—Distribution of "satisfactory" (S) and "unsatisfactory" (U) patients treated by discectomy and fusion, at end of each year of postoperative follow-up. Observed 1 year 60: "satisfactory" 1 (0.6%); observed 2 years 60: "satisfactory" 17 (28.3%); observed 3 years 51: "satisfactory" 18 (35.3%); observed 4 years 36: "satisfactory": 14 (38.9%).
* —Includes 1 refusion.
** —Includes 9 refusions.
*** —Includes 8 refusions.
**** —Includes 5 refusions.
□ —Indicates number of patients not followed up after this time.

or three levels at a later date. Four were "satisfactory" two years later, but the remainder were unimproved. Six of these were followed up for a further two years, but only two had become "satisfactory" by that time.

Of nine patients who had discectomy and fusion at one procedure at the lumbosacral level, three were "satisfactory" at two years, but six remained "unsatisfactory" for three years.

Six patients had a single-level operation for discectomy and fusion above the lumbosacral level, and three of these had become "satisfactory" four years later.

Fusion only was used for 18 patients, in half of them after laminectomy had revealed no disc herniation. The number of levels at which arthrodesis was performed varied from one to three. During the following four years, only four pa-

TABLE V.—TYPES AND LEVELS OF OPERATIONS FOR FUSION

Types	*FUSIONS* No.	*Refusions**
1. *Posterior* (66)		
Level L-4 to S-1	43	9
Level L-5 to S-1	13	2
Level L-4 to L-5	6	2
Level L3-4	2	
Level L-3 to S-1	2	
2. *Combined posterior and lateral* (9)		
Level L-4 to S-1	6	2
Level L-5 to S-1	2	
Level L4-5	1	
3. *Anterior* (1)		
Level L5-S1	1	
4. *Unknown*	2	

Techniques	*REFUSIONS* No.
Posterior	7
Lateral	3
Combined posterior and lateral	3
Anterior	4

*In two of these, two operations for refusion were done.

tients reached the "satisfactory" level of ability to work.

The type of operation used for fusion and for refusion is listed in Table V.

Refusion was carried out on 15 patients because of continued symptoms and pseudo-arthrosis. Ten of the 15 had had discectomy and fusion previously and five of them had had fusion alone. Only two finally reached "satisfactory" status.

Rates of permanent disability awards for 119 patients who were operated upon are shown in Table VI. In about 75% of them, this was between 10 and 15% of their rate of compensation for total temporary disability. This table merely tends to confirm the disappointing results of operation.

TABLE VI.—PENSIONS IN 119 PATIENTS SUBJECTED TO OPERATION

% Awarded	*No.*
5	8
10	47
15	32
20	9
25	6
30	2
45	1
50	1
100	1
Pension award unlikely	4
Pension disallowed	8

Psychological factors appeared to exert a definite effect upon the results of operative treatment in 28 patients. Twenty-seven were seen preoperatively and one postoperatively by a psychiatrist.

Post-accident neurosis (anxiety state, conversion hysteria, depression) was diagnosed in eight patients. In a further 19 a diagnosis of post-accident neurosis superimposed upon an abnormality of personality was made (constitutional temperamental instability in 11, mental inferiority in three, psychopathic or paranoid tendency in five). In 13 of these 19, some psychological abnormality had been noted by the diagnostic team or by the medical officer as well.

The psychological state of two patients made the surgeon reluctant to operate, but finally it was decided that the physical condition warranted the procedure. The psychiatrist had advised against operation for both. Later one of them had two operations and the other had four, and both were still "unsatisfactory" four years afterward.

The psychiatrist saw one patient postoperatively and diagnosed neurosis. An operation on this patient had been opposed by the orthopedic consultant at this Centre.

Fourteen of the 28 patients had two or more operations. Twenty-three of the 28 patients were still "unsatisfactory" at the time of their last follow-up.

Apart from the 28, six patients were noted by the diagnostic teams to be emotionally unstable or to show functional overlay. Though not referred at any time for psychiatric consultation, all but one were continuously "unsatisfactory" at their final follow-up.

DISCUSSION

1. *Patients Treated Conservatively*

Though only 40% of these patients had become "satisfactory" at the time of discharge from this Centre, this proportion had nearly doubled two years later. Only 13% of patients "satisfactory" two years after discharge had recurrence of disabling back pain within the last half of the follow-up. Remembering that we are dealing with a very special type of patient with low back pain, perhaps we should be pleased that nearly two-thirds of them were able to resume remunerative work by the end of two years. One-third, however, were either unable to return to work at all or had to lay off again because of the trouble in the back.

Though our understanding of the mechanism of back pain production is very incomplete, we believe that intervertebral disc degeneration was present in all patients studied and was an important predisposing cause of symptoms. If this assumption is correct, the level of physical and functional recovery reached in the patients in this series may be as high as can be expected. It is certainly our experience in this Centre that trauma superimposed on degenerative lesions of other joints results frequently in considerable permanent disability.

The lack of specificity in much of the orthodox present-day treatment and the questionable value of much of this treatment are suggested by the findings in this study. This and the suggestion made in the previous paper[1] that earlier discontinuance of treatment and substitution of placement in suitable jobs where the demands are within the physical capabilities may well be a rational approach to the problem presented by those who continue "unsatisfactory" in spite of treatment.

Of all patients in industry with accepted claims for low back pain due to causes as in those studied, there may be only a very small proportion who cannot be returned eventually to a productive life by procedures at present available to the Compensation Board under the Workmen's Compensation Act. However, there

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may well be an irreducible minimum number of patients for whom rehabilitative efforts will fail because of insurmountable difficulties related to lack of skill, low level of education, inability to communicate and various peculiarities of personality.

In regard to prognosis, it does seem important that two years from the time of discharge from this Centre appears to be a critical point. If a man has been "satisfactorily" rehabilitated by that time, he has a good chance of remaining so; if his ability to work is still "unsatisfactory", he has small possibility for escaping from that status, under present methods of management.

2. *Patients Treated by Operation*

In consideration of the low rate of success in all operative cases in this study, namely 39.5%, certain facts should be remembered. Nearly all operations were arranged after the patient's discharge from this Centre—in other words, the indications for operation were not sufficiently definite to result in referral for the procedure while still on a program of treatment here. Thus it seems likely that many patients had what we designate "an operation of frustration". These procedures are done with the hope of alleviating the complaint and with the assumption that, if this is not accomplished, at least the patient will not be made worse. In our opinion this doctrine is extremely questionable because unless the degree of improvement is sufficient to enable the man to return to his job, he will almost always be so disappointed that he will be quite unable to appreciate any lesser degree of relief. Thus the adverse psychological effect is very real and usually results in deterioration of motivation and determination, so that the level of disability is, in fact, greater than before.

Thus it appears that in 60% of the patients operated upon in this series the results were indeed real failures. Moreover, in many cases it is possible that adequate preoperative assessment of the whole man would have shown the procedure to be contraindicated. For example, it is obviously useless to blame the patient for operative failure when his personality militates against a satisfactory result from the operation. We might better accept the hypothesis that unless there is an error of technique, an operative failure is really a failure on the part of the surgeon to arrange for more complete investigation including preoperative pain study, personality assessment and consideration of the relationship of these and the man's job requirements to his capabilities. Greater attention to these factors should stimulate greater concern on our part to treat men instead of anatomical abnormalities in their backs. We then might have reasonable assurance of a much higher proportion of surgical successes.

Summary Five hundred and sixty-eight patients who had been in this Centre for treatment of discogenic low back pain were interviewed at half-yearly intervals for four years. Information was compiled concerning their continuing ability for work, troublesome symptoms and treatment during this period.

Of 340 treated conservatively who recovered a reasonable level of ability to work within two years of discharge, 87% maintained this level for a further two years.

One hundred and nineteen were operated upon and followed up for a minimum of two years. Discectomy and/or spinal fusion was followed by restoration of satisfactory ability to work in less than 40% of cases. It seems probable that more thorough preoperative assessment, with strict adherence to indications for operation, would increase this proportion.

Two years is seen to be a critical period in prognosis, whether conservative or operative treatment is used. Those who regain ability to work by this time are likely to retain it; those who fail to do so are unlikely to improve appreciably in the following two years.

It is suggested that the ultimate reduction of the proportion of patients who fail to become self-supporting will be achieved by greater success in suitable job placement, rather than by hopeful prolongation of treatment which continues to be disappointing, or resorting to surgery when its indications are less than definite.

Résumé Nous avons interviewé deux fois par an, pendant quatre ans, 568 malades qui avaient passé par notre Centre pour une lombalgie d'origine discale. Nous avons analysé les renseignements obtenus concernant leur possibilité de continuer à travailler, les symptômes dont ils se plaignaient et le traitement appliqué durant cette période.

Des 340 malades qui avaient été traités par des moyens conservateurs et qui avaient gardé une certaine capacité de travail pendant les deux années de leur mise en congé, 87% ont pu maintenir ce même niveau de production pendant deux autres années.

Cent dix-neuf malades ont été opérés et suivis par la suite pendant un minimum de deux ans. Une discoïdectomie et la fusion vertébrale (ou l'une des deux), n'ont permis de rétablir une capacité de travail suffisante que dans moins de 40% des cas. Il est fort probable qu'une étude plus complète du cas avant l'opération et, en même temps, le souci de respecter rigoureusement les indications opératoires, augmenteraient ce pourcentage. Pour le pronostic, la période de deux années est considérée comme critique, que le traitement ait été conservateur ou chirurgical. Ceux qui, à ce moment, ont récupéré leur capacité de travail, la conserveront probable-

ment, tandis que chez ceux qui ne l'ont pas retrouvée, il est peu probable qu'ils s'amélioreront sensiblement durant les deux années suivantes.

L'auteur croit que réduire, en fin de compte, la proportion de malades qui ne parviennent pas à se suffire à eux-mêmes, sera plus le rôle d'agences de placement adéquat que la prolongation d'un traitement qui continue d'être un désappointement ou le recours à l'intervention chirurgicale quand ses indications sont loin d'être définies.

Follow-up study in low back cases is one of many areas of medical research relating to occupational disability sponsored by the Ontario Workmen's Compensation Board. The study demonstrates the Board's continued interest in the problem of low back injuries in the industrial environment.

The study was designed with the advice of the Back Study Advisory Committee, consisting of Drs. B. H. G. Curry, Ian Macnab, J. L. Silversides, J. A. O'Reilly and the author.

Full acknowledgment is made to the many persons within the Workmen's Compensation Board organization for their valuable co-operation, advice and help which were so freely given. Mr. W. R. Kerr, Mr. Harry Worling and the staff of the Vocational Rehabilitation Department have been responsible for the follow-up interviews. W. F. G. Richardson, M.B., B.S.(Lond.), M.R.C.S., L.R.C.P., Research Fellow, with untiring and enthusiastic effort, has compiled and analyzed the information with meticulous care for accuracy. She has also reread and corrected the manuscript.

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Use of the GT-5 Gastrocamera in the Study of Experimentally Induced Gastric Ulcers in the Dog

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THE GT-5 Olympus blind gastrocamera has been reported to be of value in the assessment of gastric pathology and is thought to be most useful in the follow-up study of gastric ulcers in man.[1, 2] Since the introduction of the gastroscope with gastrocamera attachment, intragastric photography is most frequently performed during gastroscopy and the GT-5 blind gastrocamera is being used less and less. We believe, however, that this instrument may still be of value in the investigation and follow-up of gastric ulcers induced in experimental animals. In anticipation of a more extended investigation on experimental ulceration, we attempted to determine, in the present study, which of the areas of the canine stomach are easiest to photograph with this instrument. We have also collected information on the appearance of thermocautery-induced gastric ulcers in the dog and, in addition, we have observed the distribution of an antacid gel* in the canine stomach.

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Supported by a grant from the Ontario Cancer Treatment and Research Foundation (Grant No. 185) and the Canadian Foundation for the Advancement of Therapeutics.
*Kolantyl Gel, The Wm. S. Merrell Company, Weston, Ontario.

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MATERIALS AND METHODS

Surgical Procedure

Nine healthy dogs of 12 to 16 kg. body weight were used. Under pentobarbital anesthesia, the mucosa of the body of the stomach was exposed through an incision approximately 6 cm. long on the anterior aspect of the gastric fundus near the cardia. Ulcers approximately 2 cm. in diameter and 3 mm. in depth were induced by electric thermocautery according to the method Skoryna, Webster and Kahn[3] described in the rat. In the first four dogs, eight ulcers were produced. Four of these were created in the body of the stomach, 1 to 2 cm. above its junction with the antrum, and the other four, higher up in the fundus. At both levels the ulcers were produced on the anterior and posterior walls as well as on the lesser and greater curvatures. In the remaining five dogs similar ulcers were induced on the anterior and posterior walls and both curvatures, but only in the lower part of the body near to the antrum. The gastrocamera was inserted during the operation and the ulcers were induced while the camera was *in situ*, so as to determine the optimal depth of insertion and rotation to bring each of the ulcers in front of the photographic lens. Once these locations were noted, the instrument was withdrawn. The stomach and abdominal walls were closed and