THE RESULTS OF SURGICAL TREATMENT IN NODULAR GOITRE

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NODULAR goitre is a common disease and even in non-endemic areas it probably occurs in 4-12% of the general population (Perlmutter and Slater, 1956). Most of the goitres are small and symptomless and require no treatment. Treatment becomes necessary when the goitre is large and unsightly, when it extends retrosternally, when it produces pressure symptoms, when it is associated with toxicity or when it is difficult to differentiate between a benign nodular swelling of the thyroid and a carcinoma. In nodular goitre the occurrence of toxicity or the possible presence of a carcinoma are firm indications for surgical treatment. Where the goitre is only a problem because of its size medical treatment in the form of thyroxine has been used (Greer and Astwood, 1953). Most clinicians find however that even long-term treatment with thyroxine contributes very little to the management of large nodular goitres in adults and in these cases also, surgical treatment is usually necessary for the relief of symptoms. The surgical treatment most commonly used for nodular goitre is a subtotal thyroidectomy but quite often if the lesions are apparently localised to, or predominate in, one lobe, the surgeon is tempted to carry out a unilateral operation such as a subtotal lobectomy or even a simple excision of a prominent nodule or nodules.

In considering surgical treatment it must be recognised that clinical use of the term "nodular goitre" describes two lesions of the thyroid gland, the single nodule occurring in an otherwise normal gland and the multinodular goitre. These lesions are probably not related. The single nodule may originate in a localised area of glandular hyperplasia but it is now generally regarded as a simple neoplasm arising autonomously, despite marked variations in the histological appearances. Multinodular goitre is the late result of hyperplasia of the thyroid brought

about by inability of the gland, for a variety of reasons, to obtain or to utilise an adequate amount of iodine (Ross, J. P., 1956). These two lesions may be difficult to distinguish clinically and even when the gland is exposed at operation there may be some hesitation in deciding whether an apparently single nodule is the only pathological change or whether it is part of a more diffuse but fine nodularity of the thyroid. Where the thyroid lesion is thought to be a true single nodule or adenoma it is reasonable to assume that, as the rest of the gland is functionally normal, an operation which completely removes the adenoma and its capsule should be successful with no possibility of recurrence. Where the thyroid lesion is a multinodular goitre, however, the diffuse nature of the changes renders operative treatment more difficult. The standard subtotal thyroidectomy may well leave behind many small nodules. Even the extended thyroidectomy of Piercy and Lange (Piercy and Lange, 1957) is not free from this possibility. The risk of enlargement of residual nodules must always exist. Furthermore, multinodular goitre is a pathological expression of latent hypothyroidism. This tendency to hypofunction can only be emphasised by extensive subtotal thyroid resection. It would therefore be expected that the thyroid remnants would be subjected to increased TSH stimulation with the long-term possibility of further hyperplastic and nodular change. Both moderate and extensive thyroid resections therefore have theoretical drawbacks regarding the risk of recurrent nodularity. Is this theoretical risk substantiated by clinical experience? If so, what are the factors influencing the risk and what can be done to reduce it?

In an attempt to find the answers to these questions we have carried out a follow up study of a series of cases of nodular goitre treated by operation in the Royal Victoria Infirmary, Newcastle upon Tyne.

Patients and Methods

Three hundred and seventy four patients were discharged from the Royal Victoria Infirmary during a five year period following operations for nodular goitre. The case notes of these patients were examined and the nature of the nodular goitre and the type of operation performed were recorded. Nineteen patients had died and 10 could not be traced. Of the remaining 345 patients, 330 were examined by one of the authors and 15 were examined by their general practitioners. The presence and site of recurrent nodules were recorded. Only those cases in which distinct nodularity was felt or where the size of the remnants was too great to be explained on a basis of simple hypertrophy were included. It must be remembered that removal of part of the thyroid gland leads to hypertrophy of the remainder but that such hypertrophy is diffuse, not nodular, and is usually small. Occasionally the increase in size may be palpable but must not be confused with recurrent nodularity.

In the group of 345 patients reviewed, the ages ranged from 17 to 71 years at the time of operation, 310 were female and 35 male. A clinical diagnosis of multinodular goitre had been made in 181 cases and of single nodule in 164 cases. These patients had been treated by one of six different operative procedures: simple enucleation of a nodule, excision of a nodule with its capsule of compressed thyroid tissue, subtotal lobectomy, total lobectomy, subtotal thyroidectomy and total thyroidectomy.

Results

Fifty nine patients were found to have recurrent nodules when examined 5-11 years after operation. The overall incidence of recurrent nodularity in this group of patients is however higher than this, because 11 of the patients had had a previous operation for nodular goitre, and one patient had had two previous operations. In addition, three patients had a further operation for recurrent nodules prior to being reviewed and one of these patients had developed a further recurrence. In all there were 74 episodes of recurrent nodularity in this

group of patients, 63 of these episodes occurring during the review period.

Sex, age at operation, length of history and the histological appearances of the excised thyroid tissue were not found to have any significant influence on the incidence of recurrence. The number of recurrences following each of the six different operative procedures in all these cases of nodular goitre is shown in Table 1. From this table it can be seen that following unilateral operations the recurrence rate is almost twice that following bilateral operations. A separate analysis of the site of recurrences following unilateral operations is shown in Table 2 and this illustrates that the majority (81.6%) were in the contralateral lobe. In five of these cases recurrent nodularity was present in a residual pyramidal lobe in addition to other sites. Nodularity in superior pole remnants which has been a feature in some series (Brenizer 1957) was not encountered here.

Separate studies have also been made of the incidence of recurrent nodularity following different surgical procedures in those cases clinically diagnosed as multinodular goitre (Table 3) and as single nodules (Table 4). These tables again illustrate the high incidence of recurrence following unilateral operations. It should be noted from Table 4 that the 37 single nodules treated by bilateral operation (subtotal thyroidectomy) showed no recurrent nodularity.

Discussion

Multinodular Goitre. The nodules in multinodular goitre appear to be related to increased secretion of TSH which is in turn due to decreased output of thyroxine by the thyroid gland (Taylor 1953). In their early stages the nodules can probably be controlled by suppression of TSH output. Later the changes

TABLE 1.

RECURRENT NODULARITY FOLLOWING VARIOUS SURGICAL PROCEDURES FOR NODULAR GOITRE

	Operation	Number of Operations	Number of Recurrences	Recurrence Rate	
Unilateral Operations	Enucleation	55	8	14.5%	Recurrence Rate Following Unilateral Operations = 21.7%
	Excision of Nodule + Capsule	35	6	17.1%	
	Subtotal Lobectomy	76	23	30.2%	
	Total Lobectomy	9	1	11.1%	
Bilateral Operations	Subtotal Thyroidectomy	168	21	12.5%	Recurrence Rate Following Bilateral Operations = 12.3%
	Total Thyroidectomy	2	0	—	
	Total	345	59	17.1%	

TABLE 2
SITE OF RECURRENCE FOLLOWING UNILATERAL OPERATIONS FOR NODULAR GOITRE

Operation	Number of Operations	Number of Recurrences In Operated Lobe	Number Of Recurrences In Contra-Lateral Lobe	Number Of Recurrences
Enucleation	55	2	6	8
Excision of Nodule + Capsule	35	1	5	6
Subtotal Lobectomy	76	4	19	23
Total Lobectomy	9	0	1	1
Total	175	7	31	38

TABLE 3
RECURRENT NODULARITY FOLLOWING VARIOUS SURGICAL PROCEDURES FOR MULTINODULAR GOITRE

	Operation	Number of Operations	Number of Recurrences	Recurrence Rate	
Unilateral Operations	Enucleation	6	1	16.6%	Recurrence Rate Following Unilateral Operations = 27.1%
	Excision Of Nodule + Capsule	5	1	20.0%	
	Subtotal Lobectomy	32	10	31.2%	
	Total Lobectomy	5	1	20.0 %	
Bilateral Operations	Subtotal Thyroidectomy	131	21	16.0%	Recurrence Rate Following Bilateral Operations = 15.9%
	Total Thyroidectomy	2	0	—	
	Total	181	34	18.8%	

TABLE 4
RECURRENT NODULARITY FOLLOWING VARIOUS SURGICAL PROCEDURES FOR "SINGLE" NODULES

	Operation	Number of Operations	Number of Recurrences	Recurrence Rate	
Unilateral Operations	Enucleation	49	7	14.2%	Recurrence Rate Following Unilateral Operations = 19.7%
	Excision Of Nodule + Capsule	30	5	16.6%	
	Subtotal Lobectomy	44	13	29.5%	
	Total Lobectomy	4	0	—	
Bilateral Operations	Subtotal Thyroidectomy	37	0	—	—
	Total Thyroidectomy	0	0	—	
	Total	164	25	15.2%	

occurring in the nodule itself and in its blood supply make it more stable (Johnson 1955). At this later stage and because the disease affects the whole gland, it can be eradicated with certainty only by total thyroidectomy. Although such an operation has increased risks it has been advocated (Ross, 1956); it is argued that the operation completely removes

the disease and the resulting thyroid deficiency is easily controlled by thyroxine medication. Any operation less than a total thyroidectomy may leave behind diseased tissue, although it is claimed that by the operation of selective partial thyroidectomy "all the diseased tissue, at least all which is obvious to the naked eye, is removed, and the remnants are secretory,

to be stimulated if necessary by thyrotrophic hormone of the pituitary" (Piercy and Lange 1957).

Recurrent nodularity does not necessarily indicate that normal thyroid tissue left behind after operation has itself become diseased. It must be assumed that recurrent nodularity can also represent the further growth of nodules left behind in the thyroid remnants after an inadequate operation. On this basis the more radical the operation the less likely will be recurrence due to growth of residual nodules. The importance of this contention is well illustrated in the presented results which show a recurrence rate of 27.1% following unilateral operations and a recurrence rate of 15.9% following bilateral operations. The high frequency of recurrence in the contralateral lobe after a unilateral operation underlines the need for bilateral operations in all cases of multinodular goitre. The more radical the operation however the greater will be the tendency to hypothyroidism and the greater will be the risk of true recurrent nodularity developing in the thyroid remnants. A recurrence rate of 15.9% following bilateral operations for multinodular goitre may to some extent be due to true recurrent nodularity. Understanding the probable part played by TSH in the production of multinodular goitre and recognising that in its early stages the disease is medically controllable, there are good reasons for treating multinodular goitre by extensive subtotal thyroid resection followed by long term thyroxine medication to correct any tendency towards hypothyroidism and so to suppress pituitary TSH output. Recurrence of nodules in the pyramidal lobe and superior poles would never been seen if these parts were always removed.

The Single Nodule. In this series a surprisingly large number of cases were considered to have single nodules. As the majority of these patients were treated by a limited operation and as the state of the rest of the thyroid gland was not assessed histologically, the actual number of true single nodules cannot be derived accurately. The high recurrence rate following unilateral operations for supposed single nodules and the fact that many of the recurrences developed in the contralateral lobe suggest that many of the so-called single nodules were in fact prominent nodules in cases of multinodular goitre. Of the 168 cases of nodular goitre in this series which were treated by subtotal thyroidectomy (Table 1) 37 were

found to have single nodules on histological examination, an incidence in this group of 22.2%. Ross (1956) considers that an incidence of 23% is representative of the frequency of these tumours in general surgical practice.

As the true single nodule occurring in an otherwise normal thyroid gland is aetiologically quite unrelated to the multinodular goitre it would not be expected to behave in the same way after operation. In the present series where the diagnosis of single nodule was established in 37 cases with reasonable certainty by histological examination following subtotal thyroidectomy, there was no recurrence (Table 4). It is probable that the single nodule or adenoma could be treated quite safely by such a limited operation as enucleation but this treatment should be reserved for those cases in which there is no doubt as to the integrity of the remainder of the thyroid gland. Where such doubt does exist the patient's interests are best served by a subtotal thyroidectomy. Should histology demonstrate that the lesion is really an adenoma there is no need for post-operative thyroid medication. If the lesion should prove to be part of a multinodular goitre then long term treatment with thyroxine should be started.

Summary and Conclusions

A follow-up review, 5-11 years after operation, of 345 cases of nodular goitre treated by a variety of operations revealed a high incidence of recurrent nodularity. These recurrences were considered to be due mainly to growth of nodules left behind after inadequate operations but also to hyperplasia and eventual nodularity of the gland remnants under TSH stimulation. In view of these findings it is suggested that multinodular goitre should be treated by subtotal thyroidectomy, removing all nodular tissue apparent to the naked eye and also removing the pyramidal lobe and superior poles. Following operation the patient should receive long term thyroxine treatment to prevent hyperplastic and nodular changes in the remnants under TSH stimulation. Where a diagnosis of single nodule or adenoma can be made with certainty this lesion can be treated by simple excision but where there is doubt about the integrity of the remainder of the thyroid gland then again partial thyroidectomy is required. After operation for the true single nodule thyroid medication is not necessary as the thyroid gland is functionally normal.

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