scapulae. There was a bed sore over the sacrum, and the left leg was very painful. She had spinal curvature, and the contraction of the pelvis and the rostration of the symphysis were very marked. Labour was induced, but craniotomy was needed on account of the lateral contraction of the pelvis.

Condition on Admission.

On August 8th, 1919, she was admitted to the Leeds Infirmary under Dr. G. Watson, who kindly transferred her to my care. The albumin had disappeared, but she was in a weak, distressing, and most miserable condition. The osseous system showed many anomalies. The pelvis was rostrated (distance of anterior superior spines, 8½ in.; intercrystal distance, 9 in.; external conjugate, 6½ in., P.V.). There was marked approximation of the pubic rami, the promontory was reached with difficulty, and examination was painful. There was kyphosis in the upper part of the spine and lordosis in the lower. There was angular displacement in both clavicles at the seat of fracture. The chest was deformed. There was fracture of the upper part of the left femur with about 2 in. shortening.

The results of x-ray examination were especially interesting. The bones were so little opaque to the rays that it was impossible to obtain a good skiagram. The shape of the osteomalacic pelvis was obvious. There was a well marked fracture of the upper end of the left femur with upward displacement of the lower fragment. Several fractures could be made out in the pelvic bones and another in the right tibia.

Operation.

On September 15th, 1919, I removed the ovaries. They were normal in appearance, and the uterus had undergone normal involution. On October 15th she was very much better; she was bright and cheerful; all pain had gone, and she was able to rise from bed and hobble a short distance with a stick. The urine was normal.

Condition Twelve Months later.

The patient attended at the infirmary on September 15th, 1920. She seemed very much better in all respects. She was bright and cheerful, and had gained fifteen pounds since operation. She was free from pain, and able to walk some distance without crutches, although the shortening of the leg makes her lame. The skiagram shows that the bones are certainly more opaque than at the last examination, and there seems to be some new bone formation at the iliac crest.

I am indebted to Miss Wheatley for assistance in the clinical records of this case.

It is said that 80 per cent. of osteomalacia cases recover under this treatment. Left to themselves the women, who are as a rule very prolific, grow worse with each succeeding pregnancy, and ultimately die from exhaustion, bedsores, and so on, or from phthisis or other intercurrent disease. It is said that occasionally the disease affects males, but I have never heard of such a case in this country.

A CONTRIBUTION ON BLOOD PRESSURE IN GRAVES'S DISEASE.

BY

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Owing largely to the results of such workers as Berry in England, Dunhill in Australia, and the Mayos in America, the surgical treatment of Graves's disease is coming more and more into prominence.

The question of the operative risk in Graves's disease is one that requires most careful consideration, as operations on exophthalmic goitres are usually regarded as particularly dangerous (though with increasing experience actual figures show that the mortality is little, if at all, above that of abdominal operations). Every case must be judged on its merits, and, in addition to such general considerations as the type, stage, and the severity of the disease, it is important to gauge accurately the condition of the heart and the blood pressure. The cardio-vascular condition very largely assists one in determining (a) whether an operation can be undertaken without undue risk, (b) the nature of the operation—for example, whether preliminary ligation should be performed or immediate excision of part of the gland be undertaken.

Referring to the literature, one is impressed with the great diversity in the records of different observers, some regarding a high tension as typical, others a low, while

still others consider the condition to be inconstant at any one period of the disease. The apparent divergence is probably explained by the stage at which the observations are recorded, and curves showing the tension over long periods are conspicuously wanting.

Henry Plummer² finds an increased pulse pressure in hyperplastic toxic goitres. Hirschfelder³ in his most recent work quotes Pressaft that the maximum pressure is usually high, the minimum normal, the pulse pressure consequently raised, and he publishes a table from Krause and Friedenthal,⁴ showing readings in ten cases of Basedow's disease in which the maximal pressures ranged between 106 and 158 mm. mercury, the minimal between 62 and 66. Bain⁵ states the blood pressure is usually high. Scott⁶ finds it varies from hour to hour and day to day, and is often slightly raised, though it may be nearly normal or even much below. W. H. Cowing⁷ points out the difference in opinion, some claiming high, others low pressures as prevailing, but in such cases as have come under his observation there has been but little variation from the normal pressure shown. Janeway⁸ has, however, found that a moderately high blood pressure exists, but is inclined to think the extremeness of exophthalmic goitre cases may account for it. Percival Nicholson⁹ states that the pressure is variable, but as the disease is often accompanied by a hypertrophied heart, the systolic pressure is often raised; he quotes as typical a systolic from 140-160 mm. mercury with a diastolic from 90-110 mm. and a pulse rate of 120 or more.

Spiethoff¹⁰ is very emphatic in saying no constant changes in blood pressure show in lighter forms of Graves's disease, but in severe cases both high and low pressures occur. Donath also records varying pressures. Eve¹¹ has recorded a case, terminating in acute thyroid atrophy, in a woman aged 40, with a very variable blood pressure, rising from about normal to 240 mm. mercury, when its measurement became painful and caused petechial escape of blood from the tissues of the forearm. Professor W. T. Halstead¹² says that those cases associated with "thymus persistans" show vagotonic symptoms, among which low blood pressure may be mentioned. Herbert French¹³ states that an abnormally low blood pressure of moderate degree is apt to accompany Graves's disease. Hensen, Gross, Bing, Feldern, and Jackson consider the systolic pressure high, and are supported by Taussig,¹⁴ who finds an increased pulse pressure, and draws an analogy between the cardio-vascular phenomena in Graves's disease and those of aortic regurgitation. He finds the systolic pressure greater in the leg than in the arm in both diseases.

Turning to the experimental side of the question, we find certain observers recording a fall in tension produced by injecting thyroid.

Hale-White¹⁵ finds that the blood pressure falls when a decoction of the gland is injected, and states that the fall is vasomotor, for the heart is not affected. G. Oliver¹⁶ has shown that thyroid juice or other preparations of thyroid "seem to possess a special tendency to increase the calibre of the radial artery" in the human subject. Hutchinson,¹⁷ on the other hand, found no depression from injecting colloid alone, but a decided fall upon injecting extractives; upon separating these latter into the organic and mineral constituents he found the fall in the main produced by the former. Further, it has recently been shown that the therapeutic effects of the iodides in reducing arterial tension are probably the result of an increased output of thyroid substance produced by an increase in autolysis in the gland, consequent upon removal of the inhibitory effect of unsaturated fatty acids by their saturation with iodides.¹⁸ In this connexion it is interesting to note a case of hyperthyroidism described by Rendle Short,¹⁹ and produced by iodoform poisoning following application of this substance to an absorbing surface.

The foregoing all refer to normal thyroid secretion. What is the condition in exophthalmic goitre, however?

R. McCarrison,²⁰ believing that changes in the thyroid secretion are both quantitative and qualitative, considers that a substance is produced in the gland in Graves's disease which has a powerful action in reducing blood pressure.

Schoborn²¹ showed that the essential difference between the action of extracts of simple and exophthalmic goitres was that extracts of the latter produced a more marked fall in blood pressure. These results were confirmed by Gley,²² and important extensions were made by Blackford and Sandford.²³ Experimenting on dogs and using forty-six exophthalmic goitres, these authorities found that from quarter to half a minute after injecting saline extractives of the goitres a sudden fall in blood pressure, averaging about 60 mm. mercury, occurred; that this drop was greater than that caused by any other extract of organs; that whereas recovery occurred usually two or three minutes afterwards, this was delayed for fifteen in some cases, and that a tolerance against a second injection was established in each case. They found that simple goitres—for example, adenomas—often gave no demonstrable effect on the tension, and stated that normal thyroid juice, in much larger doses than that from the exophthalmic or simple goitres, gave only a moderate depression, not more than could be obtained by the injection of extracts of most cellular organs in large doses, but believed the supposition "that the depressor action of extracts of exophthalmic goitre to be a matter of dosage and common to all tissues" was not justifiable. They have further demonstrated that atropine did not inhibit the action of the depressor substance from

the exophthalmic glands, and that the extract did not behave physiologically like cholin, a well-known blood pressure reducing substance, nor did it increase vagus irritability, the depression being caused chiefly through vaso-dilatation, aided by some diminution of the output. Blackford and Sandford have further found a powerful depressor substance in the blood serum of patients with Graves's disease, and, finding a "crossed tolerance" existing between extracts of hyperplastic goitres and this substance, assumed it to be identical with the depressor substance from the gland.

It would appear, therefore, that the thyroid activity in Graves's disease results in production of a depressor body.

From the observations of one of us (J. S. G.), in some cases extending over twenty years, and including more particularly those cases operated on by Berry and Joll, it would appear that the blood pressure during the greater part of the disease was low. The following table of ten cases occurring in women between the ages of 23 and 48 serves to illustrate this. In each case the blood pressure is below the physiological value we should expect, this latter figure being obtained from the formula $(\text{Age} + 100) - 5$ per cent. It must be insisted that these cases are not in any way selected, but taken at random from records including cases of all types of severity, from the "formes frustes" to the most toxic types.

Patient.	Age.	Blood Pressure.	Blood Pressure Expected in Health (approx.).*	Difference.
		Mm. Mercury.	Mm. Mercury.	Mm. Mercury.
1	23	110	117	-7
2	27	90	121	-31
3	27	80	121	-41
4	30	94	124	-30
5	31	94	124	-30
6	34	120	127	-7
7	35	100	128	-28
8	36	125	129	-4
9	37	100	130	-30
10	48	125	141	-16

* Obtained by formula $(\text{Age} + 100) - 5$ per cent.

In these cases the fall in blood pressure will be seen to vary between 4 and 50 mm. The disease was well established, and the histories showed that the onset had been gradual; we believe that in each case the pressures shown were taken in the second stage of what we consider to be a typical triphasic variation occurring in the course of Graves's disease. It might be stated that in Case 2 the onset was gradual, but accelerated by the birth of a child. In Case 3 there was a family history, and the onset was gradual subsequent to shock. Case 8 was chronic but characterized by a marked exacerbation.

In our male series we find the incidence to be only one-tenth that in women, the onset to be often of a more acute nature associated with some violent shock, and, further, among the male cases it was more common to find evidence of pre-existing cardio-vascular degeneration.

Concerning male cases, it is interesting to note that while many cases of acute onset occurred in the armies during the war, inquiries by one of us (L. C. R.) at R.N. hospitals at Queensferry, Chatham, and elsewhere failed to reveal a single case after the battle of Jutland or other naval action, and Graves's disease even of insidious onset seems to be extremely rare among sailors. A search through the literature, moreover, has only revealed four cases of doubtful hyperthyroidism.²⁴

The male cases show more variation in the state of the tension than do women patients. In the ten cases of the latter, the blood pressure was in each case below normal to an extent varying between 4 and 50 mm. mercury. In the male series, however, one case shows no alteration from the physiological tension we should expect, three show a depression of 7 mm., while the remaining six an increase of tension between 2 and 30 mm. This increase was in practically every case to be explained by complications such as pre-existing arterio-sclerosis or ventricular hypertrophy—for example, in the table Cases 8, 9, and 10 all had definite arterio-sclerosis of older standing.

Patient.	Age.	Blood Pressure.	Blood Pressure Expected in Health (approx.).*	Difference.
		Mm. Mercury.	Mm. Mercury.	Mm. Mercury.
1	23	123	123	0
2	25	118	125	-7
3	26	150	126	+24
4	28	130	128	+2
5	31	124	131	-7
6	33	140	133	+7
7	38	150	138	+12
8	47	140	147	-7
9	52	160	152	+8
10	70	200	170	+30

* Age + 100.

As mentioned previously, the histories of the male cases were frequently of different type from those among women, and six out of ten shown in the table gave a history of acute onset, which may be exemplified in Cases 4 and 7. Acute Graves's disease developed in the latter case after an army action, while patient 4 was a farmer and developed acute symptoms after a fire. He received a severe shock by seeing from a distance his house burning where his wife was lying ill with her young child.

Our conclusions that blood pressure is lowered during the greater part of the course of Graves's disease are reconcilable with the vaso-dilatation as evidenced by the well known and characteristic flushings, feelings of heat, and the moistness and increased electrical conductivity of the skin, and with the secretion by the gland of the previously mentioned depressor substance. The significance of this lowered pressure as the great saving factor in the cardiac condition is obvious, for the overworked and insufficiently rested heart would exhaust itself more readily against an elevated pressure.

It will be noticed that we have shown only the systolic pressures; the diastolic readings we found to be practically unaltered from those occurring in health in people of the same age and sex. Although we believe that in the great majority of cases that come under observation for treatment the blood pressure is low, evidence is accumulating to show that it actually passes through three phases:

1. *A Preliminary Stage of Hypertension.*—This is relatively short, associated with the onset of the disease, and is probably due to peripheral vaso-constriction induced by the action of the exciting stimulus on the suprarenal. It is most easily demonstrated in cases that come on after shock, acute anxiety, or fright.

2. *A Stage of Hypotension.*—This is relatively long, lasting for months or often years. The blood pressure is below the physiological value, the lowered tension being due to vaso-dilatation induced by a depressor substance secreted by the hyper-active thyroid. It is during this stage that the majority of patients seek advice. It may be regarded as the safe operation stage. The heart is usually soft, atonic, and more or less dilated, with reflux at one or perhaps both auriculo-ventricular valves.

3. *A Stage of Secondary Hypertension.*—This is a period of gradually rising pressure which succeeds the second stage after a varying length of time, usually some years, and appears to be associated with two conditions, namely: (1) A reduction of thyroid superactivity, with a consequent relative increase in that of the suprarenal; (2) some secondary change in the cardio-vascular system, such as cardiac hypertrophy.

In each phase, and more particularly the second, diurnal variations are considerable. Our observations have been recorded systematically over varying periods, both before and after surgical treatment, and have shown that after operation an immediate and definite, but temporary, rise in blood pressure occurs. This post-operative rise may be so marked that the pre-operative pressure is doubled; this, we believe, to be caused by the relatively increased action of the suprarenals after removal of a greater or smaller part of the thyroid and the consequent reduction in the supply of the depressor substance poured into the blood, augmented by the great ingestion of fluid which is administered by some surgeons after operation, ostensibly with a view to lowering the toxæmia reputed to result from liberated colloid.* The effect of this post-operative rise in perhaps enormously increasing the work of an already partly exhausted myocardium must be borne in

* This is not borne out by the writers' experience.

mind before advising operation. It is well known that some cases die suddenly from cardiac failure after operation. Death is probably due to ventricular fibrillation, a condition shown by Levy²⁵ to occur when large doses of adrenalin are injected into the blood stream of animals. Thus it appears to us that, the other factors remaining the same, those cases with the lower pressures will be most suited for operation, since the post-operative pressure will not be sufficiently excessive to seriously embarrass a partly exhausted myocardium; and we may say that this procedure in using the blood pressure as an important indication in selecting cases for operation has been fully justified by results.

We would summarize our more important conclusions as follows:

(a) In typical and uncomplicated cases of Graves's disease the systolic blood pressure is usually lower than normal, the diastolic pressure approximately normal, and the pulse pressure consequently low.

(b) The systolic blood pressure passes through three phases:

1. *A Short Stage of Primary Hypertension.*—This is associated with the onset of the disease, and due to vasoconstriction owing to suprarenal stimulation.

2. *A Prolonged Stage of Hypotension.*—This is due to peripheral dilatation caused by a depressor substance secreted by the thyroid, and is of variable duration, but usually lasts for years.

3. *A Stage of Secondary Hypertension.*—This comes on late in the disease, and is associated with secondary changes in the cardio-vascular system and reduced thyroid activity.

(c) After operation on the thyroid the systolic blood pressure tends to rise. This rise is not infrequently associated with cardiac acceleration and an irregularity of the pulse due to auricular fibrillation, and possibly in extreme cases followed by ventricular fibrillation resulting in death.

(d) A low systolic blood pressure in Graves's disease, other factors being equal, indicates from an operation point of view: (i) Little myocardial exhaustion. (ii) A small post-operative rise in blood pressure and consequently little liability to post-operative cardiac failure. (iii) Less haemorrhage.

(e) Diurnal variations in blood pressure are considerable in Graves's disease, being relatively greater than in health.

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INTRATRACHEAL ANAESTHESIA BY THE NASAL ROUTE FOR OPERATIONS ON THE MOUTH AND LIPS.

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THE following is a brief description of a method of anaesthesia which I have found very useful in plastic operations, and which is recommended for all operative procedures in the region of the mouth. The catheter is well out of the surgeon's way, and his technique is thus rendered more aseptic.

It consists essentially of three manœuvres:

1. Passing the catheter through the nose and nasopharynx.
2. Catching it up in the oropharynx by means of a special guiding rod.
3. Directing it into the trachea.

These may be supplemented by

4. The provision of a return nasal airway, a procedure which is often a great help to the surgeon, in that it prevents bubbling of blood in the mouth and directs expired anaesthetic vapours away from him.

The following instruments are required:

Catheter.—The usual "aseptic" type of tracheal catheter.

Laryngoscope.—Hill's pattern. Illumination is obtained either by an attached distal lamp or by a pencil light pushed down by the side of the laryngoscope.

Guiding Rod.—This is a round rod of metal $\frac{1}{8}$ in. in diameter and 10 $\frac{1}{2}$ in. long. The end for picking up the catheter (Fig. 1, A) is sloped away on its under side (Fig. 1, A, (1) and (2)) for about 1 $\frac{1}{2}$ in. back in order to allow it to dip more easily from the laryngoscope into the eye of the catheter. The upper side (Fig. 1, A, (2) and (3)) is also bevelled for $\frac{1}{2}$ in. from the end to meet the under side. The terminal $\frac{1}{4}$ in. (Fig. 1, A, (2)) is now tilted upwards until the upper bevelled surface is parallel to, and only very slightly above the level of the upper surface of the rod. This slight tilt gives an upward bend to the catheter which makes its introduction through the cords much easier. The end is rounded off, and there is no sharp edge where the upper and lower surfaces meet. The other end of the rod is curved down to form a handle, bending away so that the operator's hand does not hide his view along the rod.

Details of Method.

Before starting, the end of the guiding rod is pushed from the top of the eye into the solid end of the catheter and a little notch (Fig. 1, B) made for its reception in Stage 2 (Fig. 1, C).

FIG. 1.

1. The passage of the catheter through the nose is usually easy. It should be curved with the eye facing inwards, and, after lubrication with sterile vaseline, passed through the nares with its concavity towards the floor of the nose. Stiff new catheters sometimes strike the back of the nasopharynx and refuse to go on. Rotation of the catheter—or the previous passage along its lumen of a piece of stout wire, the end of which is lodged in the notch for the guiding rod, followed by bending so that there is a very distinct tilt to the end of the catheter—will usually overcome this difficulty. The wire should, of course, be removed before proceeding to the next stage.

2. A view of the catheter is obtained by means of the laryngoscope passed to the back of the mouth. The guiding rod is passed down the speculum and its extremity pushed into the notch in the end of the catheter (Fig. 1), the outer end of the catheter being held meanwhile either between the little and ring fingers of the hand manipulating the rod, or by an assistant. After it has been picked up it is essential that the catheter be held taut outside the nose so that the guiding rod shall remain pushed home in its end.

3. The laryngoscope is now manipulated so that a view of the glottis is obtained, and the end of the catheter directed between the cords by the guiding rod, which is withdrawn before