

swelling had considerably subsided. Under chloroform anaesthesia the usual mastoid incision was made, and on exposing the bone a small worm-like body was seen at the upper end of the incision on the deep surface of the temporal muscle. This was removed and it was found to be a living worm. Mastoidectomy was not carried out as the bone appeared healthy. Ten days after the operation the patient was discharged with no further symptoms and with the wound almost healed. Up to the time of writing this note, nearly six months after the operation, the patient has been quite free from any ear symptoms, or other evidence of disease in the region previously affected.

My thanks are due to Dr. Mrigendralal Mitra for permission to operate on the case and to publish this note.

THE PARASITE.

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THE worm removed from the above case was handed to me for identification.

It is a typical male Gnathostome. The length is 15.1 mm. and the maximum diameter, which is a little behind the middle of its length, is 1.4 mm. The diameter of the head bulb is 0.574 mm. and its length is 0.257 mm. There are eight rows of single pointed spines on the head bulb, quite typical in their appearance. The body is covered anteriorly with the usual broad spines with three to five points, these give place to finer single pointed spines which finally disappear at a distance of 6.5 mm. from the anterior end. The four cervical sacs end 1.68 to 1.98 mm. from the anterior end, and the oesophagus is 3.6 mm. in length. The posterior extremity is furnished with four large papillae on each side and its ventral surface is covered with fine closely set spines. The spicules are 1.16 and 0.6 mm. in length respectively.

There is little doubt that this parasite is a specimen of *Gnathostoma spinigerum* Owen, 1836 [or preferably *G. robustum* (Diesing, 1838)]. It is similar to *G. spinigerum* (Leiper, 1911) and *G. spinigerum* (Levinsen, 1889), but comparison of the dimensions given by Levinsen and Leiper with those of the present specimen indicate that it is more mature than either of the above worms. Indeed the measurements given for the adult male of *G. spinigerum* are in some instances smaller than those in the present example, it is therefore probable that this worm is fully grown.

Discussion.—This case is of interest for two reasons. In the first place human infection by Gnathostome was not known to occur in India before the record of a case by the writer only last November, and the second point of interest is that the effects produced by this worm

suggested such a serious condition as mastoiditis.

The history and bibliography of human infection with Gnathostomes has been given so recently by the writer (*Indian Medical Gazette*, November 1929, Vol. 64, p. 274) that it is not proposed to repeat it here, and the reader is referred to the above article.

This case makes the twelfth on record, and it is interesting to note that of the four cases in which the sex has been determined they have all been males. Another interesting fact is that the worms have been found in various stages of development, from quite immature larvæ up to the specimen in the present instance, which is apparently a fully grown worm. This raises the question as to whether these worms are capable of entering the body at different stages of their life history, or whether, having gained entrance to the human host as larvæ, they are able to undergo development to apparent maturity in the tissues.

ON THE RELATIVE FREQUENCY OF SUPRACLAVICULAR AND INFRACLAVICULAR PULMONARY TUBERCULOSIS, AND ITS BEARING ON THE PROGNOSIS OF THE DISEASE IN INDIA.*

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and

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IN the diagnosis of early pulmonary tuberculosis by physical signs, it has been taken as a clinical dogma that signs observed at the apex, i.e., in the first intercostal space and above should, as a rule, be considered to be due to tuberculous disease, whilst signs lower down with nothing abnormal above the second rib in front should be looked upon as non-tuberculous in nature.

With the introduction of the Roentgen rays and their application to the diagnosis of pulmonary tuberculosis, our ideas of the pathology of tuberculosis of the lungs have undergone a considerable change. The comparative freedom from opacity of the hilum of the lung in the infant, the increase in the area and depth of this opacity in the growing child and adult, the frequent presence of opaque calcareous masses in the region of the hilum and the adjoining lung substance, the post-mortem findings of healing and healed lesions, especially at the root of the lungs and in the mediastinal glands of clinically non-tuberculous individuals dying from other causes, and the observations made in all modern countries on the incidence of allergy increasing rapidly from infancy to adult life in apparently normal individuals, as indicated by the cutaneous reaction of Von

* Being a paper read at the Medical and Veterinary Research Section of the Indian Science Congress, Allahabad, January 1930.

Pirquet, have gradually led the pathologist to a change in his views as regards the origin and course of the disease in the lungs.

It is a common observation made by the roentgenologist and the pathologist, that there is a large number of cases where signs of tuberculous deposit are evident in the region of the hilum glands and the lung substance surrounding it, without any signs of implication of the apex, and a close study of serial roentgenograms of a large number of cases of early and suspected pulmonary tuberculosis has revealed the presence of tuberculous extensions from the region of the hilum into the periphery of the lung more frequently in an upward and outward direction than towards the base, without any involvement of the actual apex. This has been explained to be due to extension of infection along the lymphatic channels connecting the central lymphatic glands in the mediastinum with the lymphoid tissue in the periphery of the lung, the anastomotic channels between the mediastinal glands, the lymphoid tissue at the apex, and the supraclavicular lymphatics being considered to be the most patent and free of all, causing a predominance in the extensions towards the apex.

In the pre-Roentgen days when the localization of tuberculous disease in the lungs had to be made by physical examination alone, which could not as a rule reveal disease at the hilum, the first signs were, for obvious reasons, noticed mostly at the apex, but with the introduction of X-ray diagnosis and the confirmation of physical diagnosis with the skiagram, it has become increasingly evident that a large number of active cases of pulmonary tuberculosis show the initial lesion below the apex, which remains free up to a comparatively late stage of the disease. Thus Fishberg(1) at the last annual meeting of the British Medical Association at Manchester laid great emphasis on what he called the subapical or subclavicular localization of tuberculous lesions in the lungs, predominating over the true apical.

William Ewart(2) and Kingston Fowler(3) in England, Fishberg and others in America, and a number of pathological anatomists on the continent have similarly described that the early lesions, as well as the cavities resulting from their break-down, are much more frequent at a distance lower down in the first and second intercostal spaces than at the apex, and Fishberg(1), by a study of the clinical history of a large number of such cases, considered that the subclavicular type of case was more acute and more virulent than the true apical cases.

The diagnosis of apical tuberculosis by physical examination alone without confirmation by the X-rays is by no means free from error. A comparative study of a larger number of cases by physical signs and by roentgenology has made it sufficiently evident that the presence of such physical signs as harsh breath

sounds, broncho-vesicular breath sounds, and even occasionally bronchial murmurs at the apex is not at all inconsistent with an apex free from disease, the causation of such abnormal breath sounds being apparently due to hilum disease or to density of tissue by deposit, fibrosis, etc., in the upper lobe between the root of the lung and the apex. It is thus evident that the diagnosis of the pathological condition by physical examination alone cannot be considered to be accurate or reliable.

In the investigation which forms the subject of this paper we have therefore relied more upon the X-ray appearances of the lungs than on the results of physical examination. It must however be mentioned that with the exception of a comparatively small proportion of cases the results of physical examination have closely agreed with the X-ray findings.

The cases constituting our series can, for purposes of pathological classification, be divided into six groups:

1. Cases of extensive implication of the lungs, including the apex, in which it was not possible to locate the original focus with certainty.
2. Cases where the lesion could be localized in the infraclavicular region, i.e., in the first or second intercostal spaces.
3. Cases in which the lesion was in the middle zone of the lung, with the rest of the lung parenchyma in a healthy condition.
3. Cases in which the lower zone of the lung was the seat of tuberculous disease, with no implication of the upper two-thirds.
5. The true apical cases where the focus was at the actual apex alone, i.e., in the supraclavicular region.
6. Cases where there was evidence of implication of the hilum glands, with little or no signs of disease in the parenchyma of the lung.

A large number of the cases, viz., 240 out of 1,497, belonged to class I, evidently on account of the cases not coming for admission into hospital until they reached an advanced stage. In a large number of cases, however, it was possible, by a close scrutiny of the skiagrams to arrive at a decision as to the primary seat of the disease. Thus cases showing extensive fibrosis or a fibro-caseous involvement in the infraclavicular region, with recent infiltration and soft deposit at the apex and downwards towards the mid zone and base, could with justification, be classified as cases where the primary focus was subapical. Many of these cases showed a cavity in the first or second intercostal space, with thick fibrosed walls and situated more towards the outer aspect of the chest. Some others of this group showed very extensive and dense involvement of one lung, with a commencing focus in the subclavicular

region of the collateral lung, with the apex of the latter quite free from disease.

A very common seat of deposit in the second and third groups was the axillary aspect of the second or third intercostal space, with the rest of the parenchyma intact. Cases with fairly extensive involvement of the middle zone and a cavity in it outside the hilum were also common in the third group.

Twenty cases had involvement of the lower zone alone, with cavities in 4 cases.

The true apical cases were very few, there having been only 4 in the series.

The most common type of the incipient cases that came under treatment were the "hilum" cases, of which there were 457 in the series. These patients were admitted into the hospital for low and irregular pyrexia, bronchitis and general symptoms including loss of appetite and fatigue on exertion, with no definite signs

general condition indicates marked toxæmia, the consequent delay in the diagnosis by the majority of medical men who have no X-ray facilities at hand, and the neglect of early treatment, account in part for the worse prognosis of pulmonary tuberculosis in this country. *The duration of the disease*, as judged by the history of the cases, seems to indicate the more frequent occurrence of the acuter cases here than in Europe. Cavities have been seen in many cases that have given a history of four weeks or less since the onset of the first symptoms, and an occasional case has come into the hospital for a haemoptysis with practically no history of previous cough, in which a skiagram has shown definite signs of a small cavity at or near the hilum or in the upper lobe.

Table I gives an idea of the incidence and the prognosis in the three stages of pulmonary

TABLE I.
Comparative results of treatment in different stages in England and in Southern India.

	RESULTS IN ENGLAND.			RESULTS IN MADRAS.		
	Arrested and much improved.	Relieved.	No benefit.	Arrested and much improved.	Relieved.	No benefit.
I. Stage	90%	9%	1%	60%	34%	6%
II. Stage	81%	17%	2%	69%	18%	13%
III. Stage	45%	37%	18%	32%	34%	34%

of pulmonary tuberculosis, excepting harsh breathing at the apices or in the hilum region, or broncho-vesicular breath sounds in those areas, deficient entry of air into the apices or bases or both, and slight impairment of the percussion note over these regions. Tubercle bacilli could not as a rule be detected in the sputum of these cases. Von Pirquet's reaction gave a positive result. Skiagrams showed marked opacities at the hilum of the lungs, often with calcified deposits in and about them, peri-bronchial thickening with heavy bronchial shadows especially towards the bases, and what looked like calcified spots in the course of the linear bronchial shadows giving them an irregular beaded appearance. A certain amount of general fibrosis, marked in a few cases, as a rule, was present. No signs of soft deposit in the pulmonary parenchyma were evident.

Judging from the above figures there seems to be a marked difference in the ratio of supra-clavicular to infra-clavicular lesions found in Southern India, viz., about 1 per cent. compared with those found in western countries, where they seem to constitute about 15 to 20 per cent. of all early cases.

The difficulty of locating early infraclavicular lesions by physical examination, even when the

tuberculosis in the Madras Tuberculosis Hospital, compared with the corresponding figures for England as given by Kingston Fowler(4). The difference between the Indian and English figures is very striking.

1. Whilst these are 15 to 20 per cent. of supraclavicular amongst early cases in western countries, there are much fewer of such cases in Southern India (about 1 per cent. in our series).

2. The acuteness of type and the prognosis of pulmonary tuberculosis for all ages are more unfavourable in this country than in Europe. This is indicated in Table I where it is seen that whilst 99 per cent., 98 per cent., and 82 per cent. of the cases benefit in the I, II and III stages respectively in England, the figures of the Madras Tuberculosis Hospital show a similar improvement in 93 per cent., 87 per cent., and 66 per cent. respectively. In the same table it is also seen that the figures for cases arrested and much improved are 90 per cent., 81 per cent., and 45 per cent. in England, but only 60 per cent., 69 per cent., and 32 per cent. in Madras. The fact that the Madras figure for improvement in stage II is better than that in stage I is apparently due to most of the stage II cases having been placed under artificial pneumothorax treatment.

Table II, which gives the relative incidence of primary localization, is very interesting.

TABLE II.

Analysis of 1,497 cases treated in the Madras Tuberculosis Hospital during 1926—1929.

Advanced cases ..	..	240
Subapical cases ..	..	389
Middle zone affections ..	..	145
Apical cases ..	..	4
Hilum cases ..	..	457
Basal affections ..	..	22
TOTAL ..	..	<u>1,497</u>

The hilum cases, where on account of the innate or acquired resistance of the individual infection has not proceeded beyond the hilum glands, naturally constitute the vast majority of the cases. This agrees with pathological findings which have revealed latent tuberculous lesions in lungs in 50 to 90 per cent. of persons dying from other diseases. The subapical cases stand next in frequency, and then come the advanced cases and the middle zone and basal affections. The true apical involvement is very rare, there having been only 4 cases in the series of 1,497.

Table III gives the prognosis of these different types. It is interesting to note that the

within a month of the onset of symptoms fare best, that patients with a history of 1 to 6 months are the most acute, and that cases giving a longer history than 6 months have a better prognosis, being more chronic in type. The majority of cases that came under observation were in the groups giving a history of 1 to 6 months of disease symptoms, which indicates that pulmonary tuberculosis of the more acute type predominates in this country.

It is not contended that the greater severity of the disease in India and the higher mortality amongst the tuberculous is due to a small degree of immunity, either racial, hereditary, or inherent in the country, where tuberculosis has been existent for centuries, and any racial immunity that can possibly result from generalized infection has had sufficient time to be established. It is presumably the social, economic and food factors, and possibly also the enervating climate that are responsible for the severer types of the affection and the higher mortality. Poverty, insanitation, ignorance, early marriage, and the tropical climate have each and all a part to play in this marked difference between the severity and prognosis of the disease in India and in the west; and the difference in the pathological localization in the lungs is most likely secondary.

TABLE III.

*Results of treatment in the various types of pulmonary tuberculosis classified according to localization.
Madras Tuberculosis Hospital.*

	Arrested.		Relieved.		No result.		Total number.
	..	%	..	%	..	%	
Subapical ..	64	40·4%	54	34·1%	40	25·4%	158
Hilum ..	103	60·9%	54	31·9%	12	7·2%	169
Middle zone ..	36	45·5%	24	30·3%	19	24·2%	79
Advanced ..	15	25·0%	21	35·0%	24	40·0%	60
Basal ..	4	18·2%	7	31·8%	11	50·0%	22

advanced and basal affections give the worst results, the middle zone and subapical affections stand next, and the hilum involvements are the most favourable.

Table IV gives an idea of the prognosis according to the duration of the disease. It is very interesting to note that patients coming

REFERENCES.

- (1) Fishberg, Maurice (1929). Apical and Subapical Tuberculosis. *Brit. Med. Journ.*, 24th August, p. 331.
- (2) William Ewart (1882). Goulstonian Lecture on Pulmonary Cavities. *Brit. Med. Journ.*, I, p. 369.
- (3) Kingston Fowler (1921). *Pulmonary Tuberculosis*, p. 117.
- (4) *Ibid.*, p. 235.

TABLE IV.

Comparative results of treatment of cases according to duration of disease in Southern India.

Duration.	Benefited.		No result.		Total.
	..	%	..	%	
One month and less ..	55	95%	3	5%	58
One to three months ..	89	75%	29	25%	108
Three to six months ..	80	72%	31	28%	111
Six to twelve months ..	77	78%	21	22%	98
Twelve to twenty-four months.	53	79%	14	21%	67
Twenty-four months and above.	73	88%	10	12%	83