Taking cases of any period up to six months' duration as "recent" cases, Tables II and III show that 71 out of the total 82 cases of acute mania and melancholia were recent, that with but few exceptions the cases giving no agglutination were recent, and that consequently the failure to agglutinate does not depend upon chronicity of the disease.

CONCLUSIONS.

From the tables the following conclusions are drawn:

1. In 50 per cent. of the total cases of acute insanity there was agglutination, whereas this was present in only 15.5 per cent. of the controls.
2. The agglutination was partial in the great majority of the cases (39 per cent.).
3. In those forms of the disease in which the cases were sufficiently numerous to permit of percentages being taken (mania and melancholia), the preponderance of partial over good agglutination was also obvious.
4. The percentage of agglutination (good and partial) was greater (58.5) in the cases of melancholia than in those of mania (45.2).
5. The percentage of good agglutination was greater in melancholia than in mania.
6. Even when the disease is quite recent in duration there is as often as not a failure to agglutinate.

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CASES OF LATERAL SINUS PYAEMIA.*

By WILLIAM SHEEN, M.S., M.D.LOND., F.R.C.S.ENG.,
Surgeon, Cardiff Infirmary and Seamen's Hospital, Cardiff.

I PURPOSE relating to you my experiences in certain cases of lateral sinus pyaemia associated with middle-ear disease which have been under my care. By this term I mean an extension of the inflammatory processes which we so commonly speak of as mastoid disease to the interior of the lateral sinus, thence to the jugular bulb and the internal jugular vein, and thence, if not arrested, throughout the circulation. My chief reason for this communication is to urge the necessity for prompt and radical surgical interference in these cases, which belong to the class of great surgical emergencies. I will commence with a brief summary of the cases:

CASE I.—Girl, aged 10, admitted to Cardiff Infirmary in 1895. Left mastoid disease. Rigors, headache, and pyrexia for four or five days. Antrum and middle ear cleared out; lateral sinus opened behind mastoid and internal jugular in neck; septic thrombus removed. Temporary remission of symptoms. Death on third day. Necropsy—secondary abscesses in lungs.

CASE II.—Girl, aged 10, admitted Cardiff Infirmary January 2nd, 1899. Right otorrhoea three years following measles. Acute symptoms one week; vomiting, mastoid pain, pyrexia, rapid emaciation; child very ill. Antrum only opened. Death twelve hours later. Necropsy—mastoid portion of lateral sinus filled with septic clot, small extra-dural abscess over roof of tympanum, septic infarcts in lungs.

CASE III.—Male, aged 13, admitted Cardiff Infirmary, February 2nd, 1899. Left otorrhoea of long standing, following measles. Radiating mastoid pain for last six weeks, with four shivering attacks. Ear discharge ceased for a week. On day following admission severe rigor; temperature 105°, pulse 178, respirations 38. Meatus occupied by polypus. Double optic neuritis. February 4th. Antrum and middle ear cleared out; much foul pus; temporo-sphenoidal lobe and cerebellum explored with negative results; extradural abscess found in sinus groove; sinus pulsated feebly, and was not opened. Temperature reached normal. Recovery uneventful. Permanent sinus left behind ear. In good health now (April 22nd, 1903).

CASE IV.—Male, aged 42, admitted Union Hospital, June 30th, 1902. Old-standing deafness in, and intermittent discharge from, right ear. Pyrexia, which subsided after syringing, but returned on July 7th with a severe rigor. Seen by me at request of Dr. Alfred Sheen, Medical Officer to Union Hospital. "Complete" mastoid operation performed on July 14th. Patient died thirty-six hours later. *Post mortem*, septic thrombus in lateral sinus reaching from genu to jugular bulb. Organs in condition which accompanies acute septic infection. No secondary abscesses.

CASE V.—Male, aged 24, admitted Cardiff Infirmary, August 5th, 1902. Right otorrhoea three years. Discharge ceased a month before admission, and pain commenced in and around ear. Daily vomiting for a week; no rigors. Temperature 104°; very ill. First operation: Antrum and middle ear cleared out. Temperature came down to 99°,

but later rose to 103°, and patient had a rigor. Second operation, twenty-four hours later: Lateral sinus exposed and freely opened, and much foul thrombus cleared out. Convalescence interrupted by attacks of pyrexia with rigors; temperature fell after 10 c.cm. of antistreptococcus serum. Now (April 21st, 1903) is well and strong; still has sinus behind ear.

CASE VI.—Male, aged 15. Private patient, under Dr. Mulligan, Abersychan, Mon. Operation at patient's house on November 12th, 1902. Left otorrhoea of ten years' duration following scarlet fever. "Polypus" removed from left ear a year ago. Four days before operation taken suddenly ill with left mastoid pain, fever, and rigors. Pain extended down neck. On day before operation five severe rigors; temperature 106°. Operation in small country house; bad light. Assistant, the village barber, who fainted at an early stage of the proceedings, his place being taken by the patient's father. Antrum and middle ear cleared out; lateral sinus exposed in its groove; foul thick pus surrounded it, and it did not pulsate; sinus opened freely, and septic breaking-down clot removed. Internal jugular opened in neck, the incision having to be extended low down to get below clot. Venous channel washed out. Recovery interrupted by febrile attacks and rigors, pain in the right side of the chest, and cough. Temperature fell after antistreptococcus serum, and after acetanilide (8 gr.), given by Dr. Mulligan. Formalin inhalations and urotropine internally were also used for a time. Boy eventually recovered, and was in good health on April 21st, 1903.

I have used the term "pyaemia" in the title of this paper in order to emphasize the general infective nature of the process which we are considering and the necessity of isolating the source of general infection to bring about recovery. Three of the cases (half the total number) died, and of these three, two had secondary abscesses in the lungs, while the third was the victim of an acute toxæmia, and might possibly have been saved by earlier intervention. Of the three cases that recovered, one was in an early stage, and the thrombus in the lateral sinus was probably only partial in character, while the symptoms of the other two showed that some general infection had taken place before the local source was cut off. They are, however, encouraging cases, as showing that recovery may follow even advanced conditions.

History.—In cases of lateral sinus pyaemia the history usually shows that the middle-ear trouble is of old standing, being a sequel of scarlet fever or measles in the younger patients; and in the older, as we have learnt latterly, of influenza. The patients are usually young adults, but they may be children, or, more rarely, older people.

Onset.—As a rule a patient who is going about his everyday occupations, accustomed to his deafness and his aural discharge, all at once finds himself the victim of a serious malady; rigors, sickness, and fever, with severe pain in and around the ear, are leading features of the onset. Less commonly, the onset is more gradual; increasing pain and fever leading up to a kind of crisis, signalized by vomiting or rigor. A cessation of the ear discharge (not really a cessation but a lessening) is not infrequently met with.

Symptoms.—In addition to the above points there is great prostration, loss of appetite and strength, with a characteristically rapid emaciation. The temperature usually remits, but may intermit: with the high fever there is a rapid pulse, coated tongue, foul breath and earthy complexion: constipation is more frequent in the earlier and diarrhoea in the later stages. There may be delirium, but the more usual mental condition is one in which the patient when roused answers questions sensibly and then sinks back into a condition of lethargy which may be interrupted by attacks of restlessness. The local symptoms consist of pain and tenderness over the affected mastoid process and over the corresponding side of the head: pain and stiffness in the muscles of the neck: sometimes oedema over the mastoid process. There is a diffuse swelling in the upper part of the neck and the cervical glands are enlarged and tender; later the internal jugular may be felt as a hard cord-like swelling. The superficial veins are sometimes greatly dilated. This was particularly noticeable in Case VI in the superficial temporal and its continuation, the external jugular. Optic neuritis is often present, but is in my opinion due more often to associated localized meningitis over the tegmen tympani and tegmen antri than to the inflammation around the sinus itself. Examination of the meatus shows a perforated or entirely destroyed tympanic membrane with thick curdy pus occupying the middle ear, or that cavity and the meatus may be filled with the infected granulation masses commonly known as polypi. If unrelieved by surgical intervention, later symptoms arise which indicate general infection. As might be expected, the lungs are first involved, and there is a teasing cough with intermittent

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pains in the chest; accompanying these there are at first no physical signs, but later there is evidence of broncho-pneumonia, or of pus in the thorax; the expectoration is haemorrhagic and purulent, and contains abundant micro-organisms. Other seats of abscesses are the liver, kidneys, joints, and cellular tissue. The later stages of the toxic process are not infrequently accompanied by an enteritis—a typhoid condition with offensive diarrhoea. At other times the systemic invasion takes the form of an acute septicaemia rather than pyaemia; this is illustrated by Case IV of my series. By local spreading of the process or the attacking of different areas at once, the symptoms of brain abscess, of meningitis, or of both may be added to those of the sinus affection. The thrombosed jugular in the neck may break down and an abscess form there.

Diagnosis.—This is arrived at not from any particular symptom but from the association of symptoms, and in many cases lateral sinus pyaemia can only be diagnosed with certainty at operation. In acute local suppuration in the mastoid process, like acute local suppuration anywhere else, the usual local signs may be accompanied by headache, fever, vomiting, and even rigors; and if, as not infrequently occurs, a little basal meningitis over the anterior face of the petrous bone be present in addition, optic neuritis will also be observed. Where the prostration and general symptoms are severe, where the rigors are marked and repeated, where there is tenderness along the course of the sinus prolonged into the neck, and swelling in the neck, with perhaps a cord-like jugular; and, still more, when there is evidence of systemic infection, lateral sinus pyaemia can be recognized with certainty. Extradural abscess in the sinus groove occupies symptomatically as well as anatomically a midway position between mastoid disease and sinus thrombosis, and could be even less easily differentiated; direct signs of jugular involvement would, of course, be absent. In extradural abscess over the tympanic roof—the other frequent situation—eye symptoms are more likely to be marked; not only neuritis, but paralyses of ocular muscles. In advanced cases of extradural abscess symptoms of cerebral compression will present themselves. The typical symptoms of cerebral abscess are, as is well known, different from those of sinus pyaemia. The commencement of an abscess is usually signalized by pain, vomiting, some rise of temperature, and one or two rigors; but the rigors are not repeated, and the patient soon settles down into the characteristic condition, with fixed headache, subnormal temperature, slow pulse, vomiting independent of food, constipation, and lethargy. Differentiating symptoms for cerebellar abscess are occipital pain, giddiness, ataxia, and yawning. Meningitis, again, by which I include all forms of meningeal inflammation, presents the usual symptoms of cerebral irritation—acute pain in and retraction of the head, photophobia, squint, optic neuritis, restlessness, and convulsions. It is where the various lesions complicate one another that the greatest difficulties in diagnosis occur. When the meningeal symptoms overshadow the others it may be impossible to tell whether they originate in extradural abscess, cerebral abscess, or sinus thrombosis. Infective processes around the sinus, in the sinus, and in the cerebellum may all occur together from the spreading of the infection backwards. In this class of cases operation alone can decide the actual condition or complication of conditions present. In my third case I was led quite unnecessarily to explore the cerebrum and the cerebellum before I found the real seat of the mischief in the sinus groove. I have had experience in other cases of such negative brain exploration happily without ill results. The possibility in advanced cases of the primary source of infection being altogether overlooked must not be forgotten. The regular occurrence of the rigors has led to a diagnosis of ague or the predominance of the abdominal symptoms to one of typhoid fever. One reads even of the secondary infection of the joints being treated as rheumatism, and of a secondary abscess in the cellular tissue being opened as an ordinary cellulitis.

Pathology.—Under the heading of pathology I can only say a few words. In children, as Macewen has pointed out, the non-development of the mastoid cells and the non-union of the squamo-mastoid suture further a ready exit of purulent material, and sinus thrombosis is uncommon. The infection may reach the sinus in one of two ways, either by destruction of the bone, so that there is direct communication between the antral cavity and the sinus groove, or by means of minute infected thrombi forming in the small veins which traverse the bone. In either case the next stage is usually suppura-

tion around the sinus, which may form a definite extradural abscess, or more commonly exist as a periphrinitis, the sinus being covered with pus and infected granulations. The contiguity of this inflammation brings about stasis of the blood in the sinus, and a thrombus forms in it, or the thrombus forms through the actual pressure of an extradural abscess stopping the blood current in the sinus. This thrombus may be partial at first, parietal or mural as it is called, and it is not at first infected; in a short time, however, micro-organisms reach it through the sinus wall, it becomes infected and breaks down into pus, some destruction of the sinus wall also occasionally taking place. When operation exposes the sinus at this stage it does not pulsate, is greyish in colour, and has a somewhat shrunken appearance. The thrombotic and infective processes extend in the direction of the blood current down the sinus and the jugular vein; an arrest may now take place, the blocking thrombus organizing and abscesses forming behind the mastoid process or in the neck; obliteration of the jugular without external abscess is even recorded. The thrombus may spread to other venous channels, particularly the superior and inferior petrosal sinuses. Although I have spoken of arrest, the more common and more serious course is for systemic infection to take place, micro-organisms or minute particles of infected thrombus being carried by the blood stream to the right side of the heart and thence to the lungs, where small subpleural abscesses form; or, getting through the pulmonary circulation, the infection may reach other parts of the body, forming abscesses in the viscera, around the joints, in the cellular tissue or elsewhere, each fresh abscess formation being accompanied by a fresh outbreak of symptoms. Although I have described the infection as reaching the sinus via an extradural suppuration, yet occasionally the minute infected thrombi, which form in the veins traversing the mastoid, may extend direct into the interior of the sinus; in such cases the protective thrombus is less likely to form, and systemic infection is of early occurrence. Indeed there may be in certain cases no thrombus formation at all. The general infection may at other times take the form of a septicaemia rather than a pyaemia, no secondary abscesses being formed. The effective micro-organism in these cases is almost always the streptococcus pyogenes. Into the details of the morbid processes which accompany such secondary complications as brain abscess or meningitis I cannot enter.

Prognosis.—It is almost superfluous to say that in this class of cases the prognosis is grave, but cases apparently in extremis have been saved by radical treatment; neither does the evidence of secondary infection, even when this has got through the lungs and reached the body, generally with formation of abscesses, necessarily determine a fatal issue. Obviously the further the disease has advanced the worse the prognosis, and particularly it has been pointed out that the lower the infected thrombus extends in the jugular the more serious is the outlook.

Treatment.—Finally, we reach the important question of treatment. Speaking with regard to this, I would emphasize in the first place the great urgency of these cases. They are as urgent as a strangulated hernia or a ruptured ectopic gestation. Secondly, I would point out that it is but seldom that a case is too bad to prohibit operative interference, and that even when the case has been prolonged and the evidence of systemic infection is definite, the cutting off of the primary infective source may save the life of the patient. The first step in the operation is the opening up of the mastoid antrum and making a free communication between it and the middle ear. I have latterly in mastoid cases operated according to Ballance's method, removing the posterior bony and cartilaginous walls of the meatus and throwing the whole into one cavity preparatory to skin grafting the cavity at a subsequent operation; but this method is, I think, unsuitable for sinus cases because it takes longer and the necessity of packing gauze into the mastoid wound, and its subsequent "toilet" prevents it cleanly and evenly granulating in a manner suitable for skin-grafting. After the mastoid and the middle ear have been dealt with the bony opening is prolonged backwards to reach the sinus groove, which, it must be remembered, lies more superficially than the antrum, and very occasionally lies so far forwards as to overlap it. The sinus must be reached, not through a little round hole, but through a free opening with broadly shelving sides, and a full vertical inch of it must be exposed. Any pus, infected granulations, or membranous material surrounding the sinus are then removed and the sinus inspected. If there is now

doubt as to whether it is thrombosed or not it should not be explored with a needle, as some have recommended, for this might carry infected material into an as yet uninfected sinus; if the condition of the sinus is doubtful the operator must carry his mind back to the symptoms observed prior to operation; if these have been such as might accompany an acute local infection only, he may stay his hand at this juncture and wait twenty-four to forty-eight hours to see if the symptoms subside; but if they do not subside, or if they have been such as to indicate, either by their severity or their character, systemic infection, then the jugular must be ligated. So we get the following three indications for tying the jugular: (1) When the sigmoid sinus is definitely thrombosed; (2) when the symptoms of toxæmia do not disappear after the lesser operation—that is, dealing with the mastoid antrum and middle ear, and possibly also with extradural suppuration; (3) even without thrombosis when there is evidence of severe systemic infection. An additional local indication would be feeling the thrombosed jugular in the neck as a hard cord. Whether it is felt or not, it is better always to ligate the jugular in thrombosis of the sinus, for it is impossible to say how far down the thrombus extends. Probing, curetting, and washing out the sinus from above are uncertain processes as far as removal of septic matter is concerned, and unsafe processes in that they are liable to detach clots which may be introduced into the general circulation. Further, bleeding from the lower end of a sinus opened behind the mastoid does not necessarily indicate that it is clear, for such bleeding may come from the occipital or inferior petrosal sinuses. Rather a bogey has been made of the ligation of the internal jugular in this operation, but quite unnecessarily so; one jugular is just as good as two. Some of those present saw a case under my care a little while ago in which the intimate adhesions between the internal jugular and a large mass of glands in the neck necessitated the removal of about 3 in. of the former, yet the patient experienced not the slightest inconvenience and went to a convalescent home within a fortnight of the operation. Similar cases are by no means uncommon.

At what stage in the operation should the jugular be opened? In my cases this was done after opening the sinus, but Ballance has pointed out that it is better practice to open the jugular first, so that the risk of any clot detached entering the circulation may be obviated. The jugular then is reached through an incision along the anterior border of the sternomastoid muscle, and having its centre opposite to the cricoid cartilage. This incision may be prolonged downwards, if necessary, in order to reach an unthrombosed part of the vein; the external jugular usually requires to be tied. The internal jugular, being ligatured, is opened above the ligation, and as much thrombus removed from below as possible. The sinus is then opened by a free vertical incision made with a tenotomy knife. On proceeding to remove the clot free bleeding takes place from the upper end; this should be allowed to continue for a second or two to wash out the septic contents, and is then easily stopped by gauze plugging. Clot is removed down to the bulb, and the venous channel washed freely through with carbolic lotion from the mastoid and from the neck wounds. Some recommend removal of the jugular from where it is divided in the neck right up to the bulb, its tributaries, the lingual, facial, and other veins being tied. This is an additional traumatism, and adds to the length of the operation. It can only be on the principle of minimizing the adverse chances, for it is impossible to block all the infection routes and absolutely remove all the infective sources—for example, the dura on the deeper aspect of the sinus remains as a possible infective source, and the inferior petrosal sinus, the occipital and condylar veins as possible infection routes.

When all the infected clot has been removed the cut end of the vein in the neck is ligatured and the neck wound disinfected and closed with drainage. The sinus openings, the mastoid wound, and the meatus are plugged with gauze and the mastoid skin wound partially closed.

The first dressing need not take place for forty-eight hours, and is preferably done under chloroform. There is usually some bleeding from the upper sinus opening. Recovery may be uncomplicated, or may be complicated by evidences of systemic infection. Antistreptococcus serum should not logically be used until the streptococcus has been found in the discharges, but as one knows that it is the usual micro-organism active in these cases, and further, as there is probably only one kind of streptococcus, and, as far as I know, only one serum, one should not hesitate to give it a trial when circumstances prevent a previous bacteriological diagnosis.

The value of the serum is uncertain, apparent benefit after its use being probably sometimes of the *post hoc* kind.

In conclusion, I should like to express my gratitude to the work of Ballance and Macewen, both pioneers in this department of surgery, and from whose writings I have largely drawn in preparing this paper.

THE PHYSICAL DEVELOPMENT OF THE LONDON SCHOOLBOY; 1,890 EXAMINATIONS.

By LESLIE THORNE THORNE, M.D. DURH., M.R.C.S. ENG.,
Medical Examiner to the Technical Education Board
of the London County Council.

At the present time, when the physical development of the rising generation has awakened a real and, by no means, unnecessary interest, among both politicians and educational experts, I venture to think that the statistics of the physical examination of 1,890 scholars of the Technical Education Board of the London County Council may be of some interest to those who are working in this important branch of public health.

The ages of the scholars range from 9 to 16 years inclusive. They are divided into two groups, junior scholars, who are under 13 years of age; and intermediate scholars under 16 years of age, for the purpose of compiling physical statistics, however, it will be more simple to combine these two groups.

The examinations were carried out between the years 1898-1902 inclusive. The class to which the scholars belong is best shown by the following particulars taken from the reports of the Board.

The junior scholarships, of which there are about 350 a year, are open to boys whose parents do not earn more than £150 per annum, and a large number of them are gained by the children of those who are in receipt of less than £100 a year. The intermediate scholarships, of which there are about 70 a year, are restricted to boys whose parents are in receipt of not more than £400 a year, but half of these are reserved for scholars whose parents earn less than £250 a year; in fact many of the parents do not earn £150 a year.

In giving the average number of junior and intermediate scholarships open for competition, only those for boys are mentioned, as the statistics in this paper deal entirely with boys.

Those statistics dealing with the heights and weights, chest measurements, cardiac examinations, and percentage of scholars with normal vision, do not include the whole 1,890 boys, as some alteration in the form of tabulation was made after the first examination in 1898-9, which prevents the inclusion of the whole number; but wherever a smaller number is dealt with, the fact is mentioned.

Analysis of the Physical Examination of 1,890 Boys. General Appearance—879 Good, 679 Fair, 240 Rather Delicate, 84 Delicate, 8 Very Delicate. Table of Heights and Weights of 1,710 Boys.

Age ...	9	10	11	12	13	14	15	16
Total number examined...	1	16	328	969	146	117	120	13
Average height ...	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
No. 10 per cent. above the average ...	4 2½	4 6½	4 8½	4 8½	5 0	5 2½	5 5	5 6½
No. 20 per cent. above the average ...	—	—	7	24	7	2	4	—
No. 10 per cent. below the average ...	—	—	1	2	—	—	—	—
No. 20 per cent. below the average ...	—	—	2	20	4	2	4	—
Average weight ...	st. lb.	st. lb.	st. lb.	st. lb.	st. lb.	st. lb.	st. lb.	st. lb.
No. 10 per cent. above the average ...	4 0	5 0	5 2½	5 6½	6 0	7 0	8 0	8 0
No. 20 per cent. above the average ...	—	—	42	130	18	19	28	3
No. 10 per cent. below the average ...	—	—	36	57	13	13	13	1
No. 20 per cent. below the average ...	—	—	55	128	30	32	32	2
No. 10 per cent. below the average ...	—	—	17	25	4	6	12	1

NOTE.—The boys were measured in their boots, and their weights were taken when they had been stripped to the waist, but had their jackets on.