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OMNIBUS ARTIBUS COMMUNE VINCULUM

# Sinus Thrombophlebitis

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# INDEX



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## I. ABSTRACT

# LATERAL SINUS THROMBOPHLEBITIS

A. L. Juers

### Incidence

Lateral sinus thrombophlebitis is one of the most frequent of the major complications of acute and chronic mastoiditis. Hooper, as early as 1826, correctly recognized both sinus phlebitis and sinus thrombosis. Zanfal, in 1880, was the first to do an internal jugular ligation and incision of the infected sinus.

### Pathology

The terms "lateral sinus phlebitis" or "thrombosis" occur in the literature probably inaccurately. It is difficult to draw an accurate distinction between a phlebitic process localized to the sinus wall and one in which, for example, a mural thrombus has already formed which may or may not go on to complete thrombosis of the vessel. Therefore, the term "thrombophlebitis" is used.

The fundamental factors in the evolution of sinus thrombophlebitis are (1) infection of the sinus wall, (2) probable slowing of the blood stream due to pressure from the products of this infection, and (3) injury from the infection in the endothelial lining to favor the formation of a thrombus.

The routes by which infection may reach the sinus wall are divided into: (1) extravenous and (2) intravenous.

Extravenous: The infection extends from the original focus in the mastoid to the sinus wall by contiguity of tissue. When the vessel wall is reached, the encroaching infection narrows the lumen of the vein producing a slowing of the blood stream. The sinus wall soon becomes involved by the inflammatory process and the trauma to the endothelial lining results in the beginning of thrombus formation. With further advancement of the inflammatory mass, the vessel wall soon becomes necrotic and the infection gains access to the interior of the vein. The thrombus at first becomes infected in its center while its ends remain sterile. If it goes on to disintegration, an intravenous abscess will be the end-result. However, the thrombus may not break down and in that event becomes organized. Coalescent mastoiditis with perisinous abscess formation and acute exacerbations of chronic otitis with mastoid involvement tend to involve the sinus wall by extravenous extension.

Intravenous: There may be an extension of thrombus formation from the smaller veins in the mucosal lining and the bony septa of the mastoid cells into the channel of the lateral sinus. Intravenous extension occurs in hemorrhagic mastoiditis due to a virulent form of hemolytic streptococcus. There is no bone destruction in this type of mastoiditis. The fundamental change here is an osteothrombotic phlebitis. Some otologists, notably Niesner, deny the existence of hemorrhagic mastoiditis as a clinical entity.

Primary jugular bulb thrombosis may involve the sigmoid sinus later by retrograde extension after the bulb is completely occluded. The jugular bulb may be involved by a direct extension of the infection through the floor of the tympanic cavity. Extension may occur from a purulent labyrinthitis through the veins accompanying the aqueductus cochleali and the aqueductus vestibuli. These veins empty into the bulb. Another route is through the carotid plexus along the anterior tympanic wall. Primary jugular bulb thrombosis is seen more in young children, under 5 years of age, because the jugular bulb is in more intimate contact with the tympanic cavity and the mastoid cells are poorly developed and in less intimate contact with the lateral sinus.

There are a number of anatomical variations which predispose the lateral sinus to thrombophlebitis. (1) A sinus lying far forward near the mastoid antrum and posterior bony canal wall is usually considered more vulnerable than one in a more posterior position. (2) A mastoid process with a thick outer table of bone seldom has a perforation of the cortex to permit the escape of pus to the outside and the result frequently is the erosion of the lateral sinus plate of bone and perisinuous abscess formation. (3) The sclerotic types of mastoids frequently have channels leading to the inner table and here again pus under pressure frequently finds its way to the dura. (4) A marked difference in the size of the two lateral sinuses may be a factor. Piersol states that the right sinus is usually larger than the left and in closer relation to the mastoid cells than the left sinus. The right lateral sinus is a little more often involved than the left. The rate of blood flow through the larger sinus is thought to be slower and as a result is probably more susceptible to thrombosis.

Brunner has expressed the opinion that exposure of the lateral sinus during operation has no influence on the incidence of sinus thrombosis postoperatively. However, if a mastoid cavity is packed tightly with gauze after operation, there is undoubtedly more danger of thrombosis than if the bony lateral sinus plate were intact to protect the sinus. Therefore, in every mastoidectomy with sinus exposure, the cavity is packed very loosely.

Classification

Boies has classified his cases as follows:

1. Manifest - present at the time of the primary mastoid operation with evidence of its existence.

2. Latent - in this type, we assume that a thrombosis has taken place, but signs of it are not manifest, and that a continued thrombus formation and production of symptoms occur as a result of the "stirring-up" due to operation.

3. Postoperative - developing entirely in the period after operation.

The manifest and latent groups are not distinctly separable as to event but only as to manifestation.

Incidence and mortality

A review of the recent literature on the statistics of lateral sinus thrombophlebitis shows considerable variation due chiefly to the difference in criteria of diagnosis used by different authors. The largest single series of cases reported is that of Boies who reviewed 184 cases seen at the Massachusetts Eye and Ear Infirmary from 1915 to 1930. Meltzer recently summarized the results of 163 cases treated at the same hospital from 1921-1932. Some cases are included in both series but their analyses are from a different standpoint. The statistics in this abstract are taken largely from these two series. During the period from 1915-1930, there were 202 cases recorded but 18 of them were admitted in a condition beyond hope of surgical aid, and were not included in this analysis.

| | No. of Cases | No. of Deaths | Mortality % |
|---|---|---|---|
| Thrombosis manifest at time of operation | 120 | 34 | 28.3 |
| Latent thrombosis | 45 | 9 | 20.3 |
| Postoperative thrombosis | 19 | 3 | 15.7 |
| TOTAL | 184 | 46 | 25.0 |
| Due to acute otitis | | | |
| 1. Manifest at operation | 71 | 17 | 23.9 |
| 2. Latent | 37 | 8 | 21.6 |
| 3. Postoperative | 18 | 3 | 16.6 |
| TOTAL | 126 | 28 | 22.2 |
| Due to chronic otitis | | | |
| 1. Manifest at operation | 49 | 7 | 34.7 |
| 2. Latent | 8 | 1 | 12.5 |
| 3. Postoperative | 1 | 0 | 0 |
| TOTAL | 58 | 8 | 31.0 |

A comparison was made with the statistics of Brunner who reported a high mortality of 50% for his postoperative thrombosis cases. The reason for his high mortality rate could not be determined.

Meltzer's summary of results obtained at the Massachusetts Eye and Ear Infirmary includes 163 cases from 1921-1932. During this time, there were 4,961 mastoidectomies done. The incidence of sinus thrombophlebitis in these cases was 3.2%. He divided the cases into two series. 1921-1926 is series I and 1926-1932 is series II. The number of mastoidectomies was approximately equal in each.

| | Incidence | Mortality including 6 hopeless cases | Mortality excluding 6 hopeless cases |
|---|---|---|---|
| Series I | 2.5% | 31.3% | 25.8% |
| Series II | 3.9 | 25.8 | 20.0 |

He believes that the increased incidence in series II is probably partly the result of making the diagnosis in some cases only on suspicious findings, whereas in series I there was too much conservatism. There were 14 fatalities in series I and 18 in series II. Allowing for the usual fallacies of statistics, we may conclude that conservatism in diagnosis or the diagnosis and treatment of early cases on cuspicious findings only do not materially influence the mortality rate.

Age

With reference to the age incidence, it was found that the preponderance of cases were between the ages of 6 and 30 years. There were relatively few in young children as compared to the number of mastoidectomies. This is explained by the fact that in young children the lateral sinus is not in very close contact with the mastoid cells which do not reach full development until the child is 5 or 6 years of age. There were several sinus thromboses in children with no mastoiditis. These probably began as primary jugular bulb thromboses and extended upward.

Symptoms and Physical Findings

Septic temperature. Spiking every 24 hours, usually preceded by a chill.

Headache on same side as lesion may or may not be present. Nausea and vomiting.

Children may have convulsions or meningeal symptoms.

The optic discs show hyperemia or early optic neuritis in 25% of cases.

Metastatic lesions sometimes are present early.

Enlargement of the spleen and liver as a result of sepsis is present in many.

Tenderness on and posterior to the mastoid tip.

Aids in Diagnosis

Blood culture - 30 to 50% of cases have a positive culture.

Blood picture - usual findings of sepsis with rapid fall in hemoglobin and red blood cells if hemolytic streptococcus is infecting organism.

Ayer-Tobey modification of the Queckenstadt test. This procedure has been found to be correct in 75 to 80% of cases. The usual lumbar puncture is done and the initial pressure recorded. Each jugular vein is then compressed separately and the rapidity of increase of pressure and the maximum pressure on each side is noted. The pressure should return to near its original reading before the other side is tried. Next, both jugulars are compressed simultaneously and the maximum reading noted. Then, the side which is tested separately gave the lesser increase in pressure is released and the fall in pressure noted and then the other side is released and the final reading is taken. If one lateral sinus is occluded by a thrombus, pressure on the normal side will obviously cause a maximum rise and fall in pressure whereas pressure on the occluded side results in no change. Poor cooperation of the patient or marked difference in the size of the sinuses of the two sides account for some of the inaccuracies of results obtained. A few cases have been reported in which the lateral sinus was absent on one side.

Complications

In the 184 cases cited by Boies, there were 79 with complications, an incidence of 43%. The pulmonary complications included pneumonia, septic infarcts, pleurisy, empyema and embolus. Orthopedic complications were chiefly septic joints.

| | No. of Cases | No. of Deaths | Mortality % |
|---|---|---|---|
| Meningitis | 12 | 12 | 100.0 |
| Cavernous sinus thrombosis | 3 | 3 | 100.0 |
| Pulmonary | 27 | 17 | 62.9 |
| Brain Abscess | 7 | 3 | 42.8 |
| Orthopedic | 11 | 2 | 18.1 |
| Erysipelas | 7 | 1 | 14.2 |
| Other | 12 | 2 | 16.6 |
| TOTAL | 79 | 40 | 50.6 |

It is Kopetzky's opinion that the nature of the complication is dependent on the type of organism and not so much on the type of lesion in the mastoid, i.e. Pneumococcus and Streptococcus mucosus capsulatas tend to invade the endocranium. Some streptococcic strains tend to invade joints and serous membranes, others the superficial structures as skin and muscles, while still others attack the lung.

Treatment

Thrombectomy. It is generally agreed that incision of the lateral sinus and removal of the thrombus until free bleeding is obtained from each end are indicated as soon as the diagnosis is made. It is also advisable to remove as much of the diseased sinus wall as possible. The ends of the sinus are then closed by means of small rolls of gauze. Almour advises excision of the diseased portion of the sinus wall as a preventive measure against thrombus formation when in a mastoidectomy a perisinuous abscess with a local phlebitis or periphlebitis is apparent even in the absence of any clinical symptoms of sepsis. It is questionable, however, if this is a necessary or justifiable procedure.

The appearance of the sinus wall at the time of operation does not always indicate what will be found within. This is particularly true in those thromboses which result from intravenous extension.

Internal Jugular Ligation. This has been accepted by most otologists as a necessary procedure in the treatment of lateral sinus thrombophlebitis. During the past few years, however, numerous objections to routine ligations have been raised. Dixon and Rott are among those who now feel that the internal jugular vein should never be ligated. It is Dixon's opinion that the sinus early becomes occluded by a thrombus and that thrombus extension is in a retrograde direction. He states that embolic infection does not tend to spread from the distal end of the thrombus through the internal jugular vein, but enters the general circulation through the collateral vessels with the sigmoid sinuses, i.e. superior and inferior petrosal sinuses, condyloid and mastoid emissary veins and possibly through the torcular end of the involved sinus to the opposite side.

Rott's Conclusions

1. The only indication to be met in the treatment of lateral sinus infection is the prompt removal of the infected area, whether it be mastoid cells, the sinus plate, the wall of the sinus or the contents of the sinus.

2. Ligation of the internal jugular vein does not prevent the absorption of toxins and bacteria into the general circulation and hence is a superfluous procedure.

3. Ligation of the jugular vein should be reserved for definite infection in the vein itself and then should be accompanied by resection.

Coates reviewed 14 cases from his service in Philadelphia and concludes "ligation is advisable -- then everything possible surgically has been done."

In Meltzer's series of cases at the

Massachusetts Eye and Ear Infirmary, metastasis appeared four times as often after ligation as before. He studied 65 cases as to blood culture; 50 of these gave a negative culture before ligation. Of these 50, 13 became positive after ligation.

The trend of most otologic opinion at the present time is to ligate at the time of the thrombectomy if free bleeding is not obtained from the lower end of the sinus after as much thrombus as possible has been removed from above. If at the time of the thrombectomy free bleeding occurs from each end of the sinus but during the next few days there is no clinical improvement, then jugular ligation is in order. Quite a few still maintain that thrombectomy and ligation should be done as soon as the diagnosis is made.

Statistics available comparing treatment by ligation and non-ligation show no appreciable difference between the two methods. However, no large conclusive series of cases has been reported. At present, there is no uniformity of indications for ligation and non-ligation.

The general treatment of the septicemia consists of transfusion and the usual supportive measures.

In determining which sinus is responsible for sepsis complicating bilateral mastoiditis, the Ayer-Tobey test is our best aid. X-ray examination to determine which side presents the most advanced lesion may be of value. Fundus examination may show more hyperemia of the optic disc on the involved side. There are some cases reported in which both lateral sinuses became involved. Hastings reports a case of bilateral jugular ligation for bilateral sigmoid sinus thrombosis. There was an interval of 18 days between the operations. The case recovered. An interval between ligations is desirable as it facilitates collateral circulation establishment.

Summary

1. The incidence of the three types of sinus thrombophlebitis in mastoiditis is about 3.2%.

2. The preponderance of cases occur between the ages of 6 and 30 years.

3. The mortality varies from 20 to 25% if cases that are hopeless when first seen are excluded. Including these cases, the mortality ranges from 25 to 30%.

4. The diagnosis is dependent on the picture of sepsis complicating mastoiditis and evidence of lateral sinus obstruction if an occluding thrombus is present.

5. The surgical treatment consists of removing the source of the infection, i.e. all mastoid cells, the diseased sinus wall, and the thrombus if one is present. The necessity of ligating the internal jugular vein is questioned by some otologists.

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## II. CASE REPORTS

### 1. POSTOPERATIVE LATERAL SINUS THROMBOPHLEBITIS.

, 8 years of age,
admitted 1-18-35.

Present History
Left otitis media, 2 weeks; discharge, 4 days. Post-auricular swelling, 2 days. Examination shows profuse purulent discharge from left canal, central perforation. Swelling, redness and tenderness behind left ear. X-ray - left exudative mastoiditis with destruction of cells.

Operation
1-19-35 - Left mastoidectomy. Lateral sinus was found exposed and covered with granulations. Mastoid cells broken down. A sub-periosteal abscess was also present. Culture of mastoid pus - sterile.

Measles
2-5-35 - German measles. Increased drainage from ear and mastoid.

2-13-35 - Temperature rose to 105. No complaints. No tenderness.

Operation
2-14-35 - Temperature septic. Tender behind mastoid tip. Blood culture positive for hemolytic streptococci. Optic discs show engorgement. Operation: Mural thrombus in sinus. Jugular ligation.

2-15-35 - 250 cc. blood transfusion.
2-17-35 - Temperature still septic. Transfusion of 250 cc.

Improved
2-19-35 - Temperature normal. Optic

discs show mild papilloedema.

3-14-35 - Discharged.

5-1-35 - Middle ear dry. Optic discs almost normal.

2. MANIFEST LATERAL SINUS THROMBOPHLEBITIS.

, 40 years of age, admitted 1-23-35.

Present History
Right chronic suppurative otitis media for 20 years. Right post-auricular abscess incised 20 years ago. Had a head cold 3 weeks previous to admission accompanied by exacerbation of right otitis. One week before admission noted slight swelling in right side of neck, accompanied by chills and fever. No vertigo or diplopia. Some headache on right side. Vomited a few times.

Physical Examination
Admission temperature 99.4. Felt chilly. Right ear - canal filled with purulent discharge, central perforation. Some tenderness over posterior border of tip and below tip. Left ear - drumhead retracted with numerous calcareous deposits. Spleen palpable. Neurological-negative. Urine - negative. Blood - Hemoglobin 77%, white blood cells 5,950, pmn's 62%. X-ray of mastoids - bilateral sclerotic mastoiditis.

1-23-35 - Temperature rise 97 to 102.

1-24-35 - Temperature rise to 101. Blood culture - sterile.

Operation
1-25-35 - Right mastoidectomy. Disintegrated lateral sinus thrombosis found and drained. No ligation of jugular. Culture from pus showed mixed cocci and rods including B. Proteus.

1-26-35 - 600 cc. citrated blood transfusion. Temperature range next several days, 99 to 100. Transfusion repeated.

2-9-35 - Some swelling in right side of neck.

Abscess
2-15-35 - Neck abscess incised.

2-28-35 - Incisions healed. Still has some discharge from canal.

Improved
3-28-35 - Discharged.

9-6-35 - Seen in Dispensary. States that a small sequestrum was extruded from right ear canal in April. No discharge since. Examination revealed that a "modified radical mastoidectomy" had been done by nature. Hearing with the watch test: right, 14/20; left, 5/20.

3. LATENT LATERAL SINUS THROMBOPHLEBITIS.

( , 18 years of age, admitted 6-15-35.

Present History
Right chronic suppurative otitis media for 10 years. Exacerbation following a cold one week before admission. Some nausea and vomiting. Questionable chill the day before admission, moderate pain behind right ear.

Examination
Conscious but drowsy. Temperature 99.8. Pulse 105. Pupils equal, react slowly to light, optic discs hyperemic. Right ear - seropurulent discharge; posterior perforation; slight edema over mastoid; tender over antrum. Neurological - negative except bilateral positive Oppenheim reflexes. Spinal puncture - pressure 120 mm. of water, normal Ayer-Tobey test, cell count 20, pmn's 1%, mononuclears 19%. Blood - hemoglobin 90%, white blood cells 19,700, pmn's 86%. X-ray - left normal; right chronic sclerotic mastoiditis.

Operation
6-16-35 - Right mastoidectomy. Small amount of subperiosteal pus in region of antrum. Mastoid of sclerotic type. Perisinuous abscess over knee of lateral sinus. Sinus covered with granulations.

6-17-35 - Temperature 105. Blood culture taken.

Operation
6-18-35 - 12 hour culture positive for hemolyti streptococci. Internal jugular ligation. Incision of sinus and thrombus removed. Transfusion given, 500 cc.

6-22-35 - Temperature still septic. Transfusion, 500 cc.

Operation
6-28-35 - Mastoid cavity reopened. Jugular bulb explored and pus evacuated. Transfusion, 500 cc.

Arthritis
7-5-35 - Temperature normal. Pain over sternoclavicular joints. X-ray shows pyogenic arthritis with osteomyelitis of medial ends of clavicles.

7-18-35 - Pain in muscles of right shoulder.

Abscess
7-21-35 - Cutaneous abscess over right sacro-iliac joint.

8-9-35 - Discharged. Post-auricular incision healing.

Well
10-1-35 - Entirely healed. Middle ear cavity dry. Audiogram shows 15% hearing loss in right ear.

4. LATERAL SINUS PHLEBITIS WITH PNEUMOCOCCIC SEPTICEMIA.

., 15 years of age, admitted 8-30-35.

Present History
Had right otitis media when a child. During past year had had earache at intervals but no discharge. Swimming always aggravated the earache. Present attack of earache began a week before admission, followed in a few days by pain behind ear and discharge from ear canal. Two days before admission, he had considerable fever and was slightly delirious. Questionable chill.

Examination
Edema and tenderness over and below tip of right mastoid. Seropurulent discharge from anterior perforation of drumhead. Appeared acutely ill. Slightly confused. Temperature 103. Neurological - negative. Blood - hemoglobin 95%, white blood cells 11,700, pmn's 87%. X-ray - chronic sclerotic mastoiditis, right, with probable abscess in tip.

Operation
8-31-35 - Temperature 105.4. Blood culture taken. Right mastoidectomy. Tip cells broken down. Some pus below tip. Lateral sinus far forward. Appearance suggests phlebitis. Culture of pus showed pneumococci.

Exitus
9-1-35 - Temperature 105.6 this P.M. Breathing irregular. Neurological - right facial paresis; tendon reflexes absent; Kernig negative; slight neck rigidity; pupils small, no reaction; no nystagmus. Spinal puncture - pressure 350 mm., cell count 158, pmn's 76%, mononuclears 24%, Ayer-Tobey test normal. Blood culture - negative 24 hours. Operation - right jugular ligation, incision right sinus, phlebitis but no thrombus found. Temperature rose to 110 and patient expired.

Autopsy
Summary
Right lateral sinus phlebitis.
Localized meningitis.
Multiple abscesses of lungs and kidneys.
Brain extremely firm as a result of the high temperature.

III. MOVIE

Title: Dravidan Glamour

Released by: New Republic Pictures

## IV. LAST WEEK

Date: November 14, 1935.

Place: Recreation Room, Nurses' Hall.

Time: 12:15 - 1:22

Program: Movie - Contacts
Tuberculous Meningitis

Present: 115

Discussion: L. G. Rigler
I. McQuarrie
C. A. Stewart
J. C. McKinley
Alex Blumstein
H. S. Diehl
Dorothy Brown
C. McDaniel
T. Love

Gertrude Gunn,
Record Librarian.

Correction: Page 84.
"Dr. Slaper" should have been "Dr. Slater."

## V. GOSSIP

The meeting last week was of unusual interest judging by the discussions. It is hoped that we will devote more time and attention to this problem during the coming year. Tuberculin testing will pick up slow chronic forms of pulmonary tuberculosis and the pre-symptomatic stage of other forms of tuberculous infections........By the way, some of the sanatorium superintendents are already retiring. With full maintenance for the superintendent and his family and an excellent salary with little expenditure has resulted in several saving enough in a short time to retire to a comfortable existence long before the expected time......Dr. Robert Wright, dental resident from Australia, will leave for Guys Hospital, London, to continue his graduate work in oral surgery. Australians, according to Dr. Wright, are much more American than British. In a recent interview, he marvelled at our life of speed and pleasure seeking. Apparently, it did not take him very long to become accustomed to our ways as he will be sadly missed by many of our fair sex. Dr. Wright made many friends here and advanced the cause of Australian dentistry. Last year, we had a visit from Australian social workers who were also intrigued by American customs. One of them after witnessing a basketball game was most interested in the antics of the "mirth maker" (cheer leader to you).....In small towns, school children sell Christmas Seals from door to door. As they eventually become a nuisance, the lady of the house is told to put a Christmas Seal on her door knob to avoid further sales attempts. A woman in a small town (nationality not stated) recently qualified for the world's tightest person by buying one seal and putting it on her door knob.......In a class of 370 students it was found that 68% were suffering with an acute head cold yesterday. The peak of incidence is said to be in October and November. When you pronounce Benzedrine your way you may offend Smith, Kline & French Laboratories, Philadelphia, if you do not pronounce it Benzedrine. The odor is not the potent part, which makes it possible to use "controls" in investigating its efficiency. In compiling attitudes toward the various treatments of the common cold, it is interesting to note the positive opinions many people hold as to their method of treatment.....The Health Service is still continuing studies of the treatment of the common cold. A recent request for volunteers almost swamped the Service. There was a time when no one thought of consulting a physician about the treatment of a cold. One of our recent graduates said that his records for the most part were the story of respiratory infection. When people become more health conscious, they will expect greater interest in so-called minor health problems. Wonder when the next Influenza epidemic will be along.

* * * * * * * * * *

NO MEETING NEXT WEEK -- THANKSGIVING

- - - - - - -

DECEMBER 5TH: HIGHLIGHTS OF THE 1935 FOOTBALL SEASON - Movies - 1 Hour.