GONOCOCCUS JOINT DISEASE IN INFANTS

SECONDARY TO PURULENT OPHTHALMIA

WITH TWENTY-THREE CASES

BY

R. CLEMENT LUCAS, B.S., M.B.LOND., F.R.C.S.ENG.
SURGEON TO GUY'S HOSPITAL; CONSULTING SURGEON TO THE EVELINA
HOSPITAL FOR CHILDREN

Received September 20th, 1898—Read January 24th, 1899

IN the 'British Medical Journal' of February 28th, 1885, more fully on July 11th, 1885, and again, with the addition of a third case, in the same journal on October 10th of that year, I drew attention to a form of joint disease in infants which previous to that date had not been recognised or described.

The first case, an infant eighteen days old, suffering from purulent ophthalmia, was referred to me by a colleague on account of an acute arthritis of the left knee and a milder form of inflammation of the left wrist. It at once struck me that the very acute inflammation of the knee, indicated by great pain, redness, and swelling (resembling a joint in which suppuration was threatening,

or had already taken place), must have some definite relation to the conjunctival inflammation. The case reminded me of some very acute joint affections I had seen in association with gonorrhœa among adults, one especially in a woman whose knee-joint was pronounced by two very eminent surgeons to contain pus, yet it subsided without being opened; and another in a young man who was placed in the isolation ward at Guy's Hospital, under my care, as a case of erysipelas of the foot, yet in his case also, when the gonorrhœa was discovered and treated, the joint affection rapidly subsided without suppuration.

With these and similar cases in my mind, I felt convinced that the joint affections of this newly-born infant were dependent upon the purulent ophthalmia from which he began to suffer two days after birth, and in my first communication I wrote as follows:—"I am not aware that any connection between ophthalmia neonatorum and synovitis has ever been observed or described; but there seems no just reason if, as is generally supposed, the synovitis of gonorrhœa is the result of absorption of morbid products from the urethral mucous membrane, why the conjunctival mucous membrane should not offer an equally favorable absorbing surface. It is scarcely probable that the inflammation of these two joints could be referred to any other cause; and in my own mind there exists no doubt whatever that this is a case of gonorrhœal rheumatism consequent upon absorption from the conjunctival surface."

It will be remembered that Neisser first described the gonococcus in 1879, but it was not till 1885, the year my observations were published, that Bumm proved the pathogenetic relation of the microbe to the discharge, so that "absorption of morbid products" was the general term I used for what would now signify the entrance of the gonococci through the conjunctival mucous membrane to the lymphatics or blood-vessels.

As to the inoculation of the gonococcus in my first case there could be no shadow of doubt, for all three

patients—father, mother, and infant—who contracted the contagion in succession were under hospital treatment at the same time. I was very careful to exclude the possibility of the joint affection being caused by syphilis, and of this disease there was no evidence whatever. Treatment was directed towards the cure of the ophthalmia, and merely an evaporating lotion was applied to the knee, the inflammation of which had completely subsided at the end of five weeks.

Commenting on the difference in severity of the inflammation of the wrist compared with that of the knee, I threw out the suggestion that further experience would probably show that there were in infants two forms of joint disease caused by infection through the conjunctiva—a very acute arthritic variety and a mild form of synovitis causing effusion without redness, corresponding to the forms met with in gonorrhœal rheumatism of adults, and that the milder form in infants would be liable to be overlooked. “I make this suggestion,” I wrote, “not merely from analogy, but because the inflammation of the wrist in my first case never reached the height of the inflammation of the knee, and therefore the two forms may possibly be found in the same individual, or the type may be throughout of the milder kind.”

The third case, which I published in the ‘British Medical Journal’ of October 10th, 1885, proved the correctness of this prophecy. The infant, born of a mother who had suffered from a purulent vaginal discharge for two months before delivery, began to suffer from purulent ophthalmia two days after birth. A fortnight later its left knee was noticed swollen, and the child cried if the limb were moved or touched. When I saw it there was a good deal of effusion but no redness, and with the cure of the ophthalmia the synovitis subsided.

The study of these cases, therefore, showed that the ophthalmial rheumatism of infants may attack the joints in two distinct forms, viz. (1) as a very acute arthritis,

accompanied with much swelling, tenderness, and redness, strongly suggesting a tendency to suppuration ; and (2) as a subacute synovitis, giving rise to a good deal of effusion, and pain on movement, but to little or no surface redness.

On October 31st, 1885, Mr. R. G. Fendick, of Clifton, published in the 'British Medical Journal' a fourth case in support of my views. His patient was the child of parents both suffering from gonorrhœa. The ophthalmia commenced on the third day after birth, and ran a rather severe course. During the third week after birth Mr. Fendick was sent for to see a swelling of the child's knee, and found the left knee full of fluid, semi-flexed, hot to the hand, with pain on movement. The father had not had syphilis, and three elder children were healthy and robust. The treatment adopted was purely local, and with the cure of the ophthalmia the inflammation of the knee rapidly subsided. From that time up to the present, a period of thirteen years, I believe no new case has been published by any British surgeon. The observation appears to have fallen quite dead in this country, and writers of text-books have, for the most part, either entirely ignored the original memoir or feared to commit themselves upon it. Mr. C. N. Macnamara, however, in the third edition of his work 'On Diseases of Bones and Joints,' published in 1887, quoted very fully my observations, but this stimulated no further inquiry ; and as about this time I ceased to attend out-patients, both at Guy's Hospital and the Evelina Hospital for Children, I lost the opportunity of adding to the number of my cases.

Happily, as not unfrequently happens, the newly described disease attracted more attention abroad, and I am now able to give an analysis of upwards of twenty cases, collected from various sources ; and the publishers of these reports almost invariably give me the credit of having made the first observation of the disease.

Shortly after my second communication to the 'British

Medical Journal,' Dr. Philpot published in the 'Lancet' of October 6th, 1885, the case of a child aged nine years, who had certain joints affected in association with vulvovaginitis of gonorrhœal origin. These cases occur in older children, and are more strictly analogous to the gonorrhœal rheumatism of adults. Although in Dr. Philpot's case the vulvitis was traceable to defilement by a young man suffering from gonorrhœa, in other more numerous cases the vaginal inoculation appears to have been traced to sponges, towels, or diapers used by those suffering from gonorrhœa, or to secondary inoculation from purulent ophthalmia. These cases are not uncommon between the ages of two and ten years, and should be kept distinct from the ophthalmial rheumatism of newborn infants, which I wish more especially to draw attention to. Dr. Vignaudin, in the 'Revue Mensuelle des Maladies de l'enfance' of May, 1895, gives a very good account of these two classes in which Neisser's gonococcus plays the chief part.

ORIGIN OF THE OPHTHALMIA.

Of the twenty-three cases of ophthalmial joint disease, collected and briefly reported at the end of this communication, it will be found that eighteen were due to ophthalmia neonatorum caused by inoculation from mothers who were suffering from vaginal discharges at the time of labour. The remaining five had the conjunctivæ inoculated at a later period.

The date on which the purulent discharge from the eyes was first noticed was in two cases the second day after birth, in five cases the third day, in two cases the fourth day, whilst in one case it did not appear till the fifth day in one eye, and extended to the other eye on the seventh day after birth. In the other cases the exact date of the appearance of conjunctivitis is not noted. From these cases it would seem that the third day is that on which purulent ophthalmia most gene-

rally declares itself. Of the five secondary inoculations, Widmark's case caught the ophthalmia from another child on the sixteenth day after birth; Debierre's case from a younger sister, who was suffering from ophthalmia neonatorum, hence probably three or four years old, though not stated; one of Darier's patients was two years, the other four years of age. Morax's patient was seven years of age; she had been inoculated by the finger of a girl aged four suffering from vulvo-vaginitis.

TIME AT WHICH THE JOINT DISEASE APPEARS.

A study of the cases collected brings out very clearly that the date after the appearance of the ophthalmia at which the joint disease may be expected to show itself is towards the end of the second week or during the third week. Thus in no less than eight cases the joint affection was noticed first during the third week of the ophthalmia (Widmark, Fendick, Darier [2], Lindermann, Escherich, Haushalter, Griffon). Seven cases were first noticed to have inflamed joints during the second week after the appearance of ophthalmia, viz. two on the tenth day (Morax, Berenstein), four on the twelfth day (Lucas [2], Debierre, Deutschmann), one on the fourteenth day (Sobotka). Thus the second and third weeks account for two thirds of the cases. Of the earlier cases, putting aside the case mentioned by Ashby and Wright, on the testimony of the friends that the joint affection was present on the day of birth, two cases (Zatvorniski's and Tyrrell's) appear to have shown joint inflammation on the fourth day of the ophthalmia. Of the cases late in appearance Hoëck noted one in the fourth week and another in the fifth week, whilst Davies-Colley's case did not appear until the thirteenth week of the ophthalmia. With regard to the case briefly mentioned by Ashby and Wright, where "erysipelas of the hand" was noticed on the evening of birth and stiffness followed, I presume the wrist was injured at birth and became secondarily

infected through the conjunctivæ. The only other explanation of so early an occurrence of the joint disease would be that the membranes had ruptured a day or two before delivery, and the vaginal infection thus allowed to reach the eyes. Ophthalmia at birth has been noticed by Parichew in a case where the membranes ruptured three days before birth ('Revue générale d'Ophth,' 1893).

THE JOINTS MOST LIABLE TO BE AFFECTED.

Although taken collectively the cases show that there are few joints which in some one or other case may not have escaped, the disease shows a very decided predilection in favour of the knees, which were inflamed in no less than fourteen cases. Moreover, there was a great preponderance in favour of the left knee, which was inflamed in ten cases. Next to the knee the left wrist has been noticed inflamed most often (six cases), but the elbows, ankles, hip, and joints of hand and foot have also been seen affected, and in two cases the tendon sheaths. The frequent occurrence of the disease in the left knee and left wrist cannot, I think, be due to chance, and requires some explanation. This I do not think we need go far to discover. It is known that sprained or injured joints have their resistance to the entrance of pathogenetic microbes lowered, and thirty per cent. of sprained joints in the lower animals become tubercular if the animal be injected with the tubercle bacillus in some other part of the body. Now mothers and nurses usually by preference carry the infant on the left arm so as to have their own right hand more free for use; consequently whilst the infant's right arm and to a less extent its right knee are protected by the nurse's body, the left knee and left wrist of the infant are the joints most exposed to cold and injury. I believe this to be the explanation, the most exposed joints being those most liable to injury and to infective inflammation.

COURSE AND DURATION OF THE INFLAMMATION.

The joint affection being secondary to a gonococcus infection of the conjunctival mucous membranes, the disease will have a tendency to subside as the germinating centres on the conjunctivæ become disinfected. Thus we find in Tyrrell's case, where the infant was born in hospital and received immediate and active treatment, the ophthalmia was cured in nine days, and the joint disease, which commenced on the fourth day of the ophthalmia, began to subside five days later. On the other hand, in cases where the ophthalmia is less early, less actively, or less effectively treated, the joint disease is likely to be slower in its tendency to resolution. The acuteness of the ophthalmia, however, does not appear to bear any relation to the occurrence of the joint disease; but it would rather seem that a lack of resistance on the part of the infant, or perhaps some slight injury, determines the joint inflammation. Though some few have recovered in from ten days to a fortnight, the majority run a course of from three to five weeks before complete resolution takes place.

Complete resolution may, however, be always looked forward to with confidence, even when the inflammation is so intense as to suggest suppuration in the joint. This complication very seldom occurs, and the resolution is so complete, that as a rule no loss of mobility follows. In the cases where more serious results occur I make the suggestion that the effects of another microbe have been added to those of the gonococcus.

RELATION OF THE GONOCOCCUS OF NEISSER TO THE JOINT AFFECTION.

Darier, in the year 1889, appears to have been the first to show the presence of the gonococcus in the secretion from the conjunctiva in these cases of ophthalmia neonatorum, but Deutschmann in 1890 went further, and by aspirating an inflamed knee of an

infant three weeks old suffering from purulent ophthalmia was able to show the presence of the gonococcus in the secretion of the joint. Thus the chain of evidence was completed. It may be taken for granted, then, as conclusively proved by the evidence of these and of other observers who have followed them, that the joint disease which I described in 1885 is, as I then indicated, dependent upon a gonococcus infection of the conjunctivæ spreading therefrom and secondarily affecting the joints. In six cases in which joints were aspirated by various observers, the gonococcus was found in the secretion of the joint.

THE QUESTION OF DOUBLE INFECTION.

It will be within the experience of all present that gonorrhœal rheumatism of adults may be seen to give rise to inflammations of joints of varying intensity, but that like the inflammations due to acute rheumatism (the microbe of which still remains undiscovered) the joints affected very rarely suppurate. Now, as I have shown, this is equally true of the ophthalmial joint disease of infants; but it will be noticed that three of the twenty-three cases collected ended in suppuration, viz. one of Hoëck's, Sobotka's and Griffon's cases. This leads to another question of great bacteriological interest, viz. when suppuration takes place, are we any longer dealing with a pure gonococcus infection of the joint? Judged by the fact that the gonococcus inoculated on a mucous membrane like the urethra or conjunctiva is there sufficient to excite suppuration, one would anticipate that filtered through the vessels or lymphatics it might be likely to cause suppuration in joints also; yet this is admittedly rare. The question I would put is whether where suppuration of a joint takes place, we are not then dealing with a double infection—gonococcus inflammation *plus* the inflammation of some other microbe? Now it is very remarkable that in two out of the three cases in which suppuration occurred, another microbe

was actually identified in association with the gonococcus. In Sobotka's case, which recovered, streptococcus was identified, and in Griffon's case, which died, staphylococci were found. These facts should lead to further and more exact bacteriological examination in the cases where suppuration occurs.

DIAGNOSIS.

The joint affections with which this might possibly be confounded are those due to syphilis, acute rheumatism, tubercle, and fevers.

Syphilitic joint disease, dependent on hereditary taint, is that with which the confusion would be most likely to be made, and, indeed, when I first described the disease several of my friends thought I was probably overlooking this possible cause of joint inflammation, and it was argued that as the mother was unfortunate enough to acquire gonorrhœa she might be suspected of having acquired syphilis also.

In almost all the cases of ophthalmial joint disease the inoculation of the conjunctiva takes place at birth, and the joint affection follows soon after, whereas syphilitic joint disease rarely appears till towards the end of the first year, and is then commonly associated with enlargement of the epiphyses and pseudo-paralysis of Parrot. The gonococcus inflammation is more painful, and the syphilitic is preceded by other signs of syphilis. In Moncorvo's case there existed ophthalmia, vulvitis, and syphilis. Taken alone it would be scarcely worth including in this series, but as the ophthalmia appeared first and the vulvitis was a secondary inoculation I have included it, and the rapid course run by the joint inflammations points to gonococcus rather than to syphilis as the cause.

Acute rheumatism seldom occurs in children before the age of four or five. It is accompanied by acid perspirations and prolonged fever, and is influenced by the administration of salicylates. The ophthalmial rheumatism attacks few joints, occurs very early (unless due to

secondary infection), is uninfluenced by salicylates, and bears no relation to a rheumatic diathesis. According to M. le Dr. Vignaudin, in not one of the cases that he collected was there any history of rheumatism among the parents. It has a tendency to resolution as soon as the ophthalmia is effectively treated and completely cured.

From *tubercular disease* it is distinguished by its more rapid course, greater pain, more effusion and redness, and associated purulent ophthalmia. In any case, indeed, where an acute or subacute joint inflammation is found in association with purulent ophthalmia the probable dependence of one on the other should be taken into consideration.

From *joint affections following scarlet fever or other acute diseases* it is to be distinguished by the presence of the ophthalmia, the early age of the patient, and the absence of history of an exanthem. Only in cases of secondary inoculation, occurring in older children, would there be likely to be confusion.

The treatment should be directed mainly to the early and complete cure of the purulent ophthalmia, which is the infecting source. As soon as the frequent application of antiseptic lotions to the surface of the conjunctivæ has cured the ophthalmia, the joint disease may be expected to subside. Locally, evaporating lotions may be used to reduce the surface heat, or wool may be wrapped round to protect the joint from injury, and a bandage lightly applied. In young infants little can be done in the way of fixing the joint which in an older child would be of advantage. Now that the pathology of these cases has been clearly proved, I should deprecate the employment of an aspirator for mere curiosity.

Abstract of Twenty-three Published Cases.

No. I (Lucas, 'Brit. Med. Journ.,' Feb. 28th, 1885).—A male infant, aged 18 days, was brought to see me on February 12th, 1885, by his mother, M. B—, aged 34. She had been twice married. By her first marriage she had given birth to

five children, all of whom were living and healthy. None of these had suffered from rash or snuffles. She married a second time five years ago, and the infant brought was the second child of the second marriage. The elder of these was now 2 years and 6 months; she had suffered from no syphilitic symptoms. A week later she was brought for my inspection, and appeared perfectly healthy. The mother had never had miscarriage, rash, sore throat, or any symptom attributable to syphilitic infection.

About a fortnight or three weeks before her labour she noticed that she was suffering from a thick purulent discharge, and accused her husband of having infected her, which he admitted when she discovered he was attending at the hospital for a discharge from the urethra.

A day or two after birth the child was noticed to have a purulent discharge from the eyes, and was treated from the hospital with alum lotion. About a fortnight after birth, whilst the discharge from the conjunctivæ of the infant was still profuse, the mother noticed that its left knee was enlarged and painful, and that the child cried when it was moved. A little later the left hand was observed to drop, and the left wrist was noticed to be painful on movement.

On examination the knee was found greatly enlarged. It contained a considerable quantity of fluid, so that the patella floated, and was sufficiently red to indicate a possible tendency towards suppuration. The swelling was not merely a distension of the synovial membrane, but the enlargement was equally distributed above and below, so that it could not be traced to inflammation of either epiphysis. The mother said the knee had gradually increased in size since she first noticed it painful. The wrist was enlarged but not red; it creaked on movement, and this caused pain, so that the child cried. The only local treatment employed was the application of dilute lead lotion over the inflamed joints.

February 19th.—The wrist was more swollen and slightly red. The knee was less inflamed, but not diminished in size. The purulent ophthalmia was still profuse. A stronger alum lotion (8 grs. to an ounce of water) was now ordered to be dropped into the eyes every half-hour after bathing away the discharge.

26th.—The effect of the increased strength of the lotion on the eyes is very marked. The purulent discharge has almost entirely ceased. The wrist is much better, and only very

slightly swollen. The knee is also better, but still large and somewhat hot.

March 5th.—The eyes were now well, and the corneæ were quite clear. The wrist had recovered, and could be moved without pain. The knee was very much less inflamed and less swollen; the redness of the surface had disappeared.

25th.—The inflammation of the knee had quite subsided, and the joint could be moved without pain.

April 9th.—The child was again brought up for inspection. He had greatly improved in health and strength. The joints were well. He showed no signs of inherited syphilis.

No. II (Lucas, 'Brit. Med. Journ.,' July 11th, 1885).—For the following case I am indebted to my colleague, Mr. Davies-Colley, who kindly hunted it up in an old note-book after discussing with me the case previously related. It was headed in his note-book "Pyæmic abscess of knee-joint in a newly-born infant;" but the subsequent history stated that the joint recovered without suppuration.

L. T—, aged 3 months and 2 weeks, was first seen on May 2nd, 1874. The mother had suffered from discharge ever since her confinement (seventh child). The child had bad eyes four days after birth. She attended under Mr. Higgins for gonorrhœal ophthalmia. The left knee-joint had been affected about eight days. She had now the left knee-joint red and full of fluid.

May 13th.—There was diarrhœa. The knee was less swollen.

June 3rd.—She was better. The knee was nearly well; it had not suppurated. The only treatment mentioned is Aqua Calcis.

No. III (Lucas, 'Brit. Med. Journ.,' Oct. 10th, 1885).—A woman aged 26, brought her infant to see me on July 16th, 1885, suffering from ophthalmia neonatorum and a swollen knee.

She gave the following history:—She was married four years ago last October. Her first child was born at the seventh month on the last day of the following July. It suffered neither from rash nor snuffles, and lived to the age of seven months, when it died of whooping-cough. Between this and the next she had an early miscarriage about the second month. The second child was born on March 9th, 1883, at full time and healthy. It suffered neither from rash nor snuffles, and lived to be a year and six months, when it died of measles. The

patient was her third child, born June 20th, 1885. The eyes were clear at birth, but two days later they began to discharge. The mother was given a lotion which she thought too strong, so bathed the child's eyes only with warm water about every half-hour. A fortnight after birth the child's left knee became swollen and painful, and it cried when the knee was moved or touched. About the same time a red rash appeared over the child's buttocks, which the mother attributed to the use of soda in washing the child's diapers. The diapers are made of coarse towelling. The eruption is a bright red vesicular eczema, confined to the region irritated by the child's excretions. There are no coppery shining spots characteristic of syphilis. The hands, face, and mouth are free from eruption, and the child has no snuffing at the nose. The mother suffered from a yellow discharge from the vagina for about two months before the birth of the child. She had never suffered from any skin eruption or sore throat.

The house surgeon saw the case at the first attendance, and ordered a borax lotion and a grey powder.

July 23rd.—First seen by me. The eyes were still red and secreting pus, but better. The rash on the buttocks was bright red and vesicular. The left knee was semiflexed and the joint distended with fluid, but the skin was not red on the surface.

This case ran a mild course, and with the cure of the ophthalmia the synovitis rapidly subsided.

No. IV (R. G. Fendick, 'Brit. Med. Journ.,' Oct. 31st, 1885).—In this case the father had had a gleet for eighteen months, and the mother a discharge from which she had been suffering for several months before her confinement. She was attended by Mr. Fendick in her three former confinements, and the children are all healthy and robust. The father has never had syphilis. The ophthalmia commenced on the third day after birth and ran a rather severe course, but eventually was cured by the usual astringent treatment combined with scrupulous cleanliness.

During the third week after birth Mr. Fendick was sent for to see a swelling of the child's knee, and found on examination the left knee-joint full of fluid, semiflexed, hot to the hand, with pain on movement. The treatment adopted was purely local—warm fomentations, &c., and latterly the application of a lini-

ment of iodide of potassium and soap. "The knee is now rapidly improving; the pain has subsided, the swelling is much less, and the child is beginning to use the limb with freedom, and will I think make a good recovery."

No. V (Zatvornitski, 'Wjestnik Ophtal.' 1885).—In a newly-born infant ophthalmia appeared first in one eye, and, through carelessness and want of attention, it extended into the other eye, and lasted about six days. When the ophthalmia was most acute it was noticed that the right elbow and wrist became swollen and inflamed, and shortly after the left ankle. The child's temperature was 40° C., and it was very prostrate. The inflammation of the joints continued for some ten days, after which it gradually subsided.

No. VI (Debierre, L., 'Revue générale d'Ophtal.' 1885, p. 209).—The author alludes to Mr. Lucas's original observation in the 'Brit. Med. Journal,' which is abstracted, and relates the following case from the clinique of Dr. Ed. Meyer.

Amedée D—, infected March 28th by his little sister, who was suffering from ophthalmia neonatorum. Very severe purulent ophthalmia of both eyes, with chemosis of the conjunctivæ and infiltration of the corneæ followed. It was treated with scarification, followed by cauterisation with mitigated silver nitrate stick and lotions of 1 in 5000 of mercuric chloride. Conjunctivitis healed without leaving any trace.

On the twelfth day after contagion the child was suddenly seized with acute inflammation of the left elbow, swelling, and violent pain on movement. The arm was rendered immoveable by dressings, and tincture of iodine applied. The inflammation lasted about three weeks. No other joint was affected.

No. VII (Widmark, Dr. Johan, 'Jahrbuch für Kinderheilk,' vol. xxix, 1886, p. 157).—A boy born April 22nd, 1885, was seized on the sixteenth day of his life with purulent conjunctivitis, possibly by infection from another child. The conjunctivitis was not acute, but obstinate, for in spite of daily treatment it lasted two months. Gonococci were found in the secretion.

On the sixteenth day of the disease the right knee and foot began to swell, and the skin over them was red and tense. The swelling was very tender. Wet applications were put over the swollen parts, and the limb fixed by means of a bandage. On

the eighth day the swelling had begun to diminish, and in fourteen days it had disappeared.

No. VIII (Darier, 'Archives d'Ophthal.,' 1889, p. 175, Case 1).—A child 4 years of age, with very severe purulent ophthalmia.

At the end of the third week the mother noticed that the child cried when the right hand was moved. The metacarpo-phalangeal joints, and particularly that of the index finger, were red, swollen, and very painful. The inflammation subsided in eight days, and twenty days after the onset the movements of the joints were quite free and without pain.

No. IX (Darier, 'Archives d'Ophthal.,' 1889, p. 175, Case 2).—A child of 2 years with purulent ophthalmia, the pus from which was found to contain gonococci.

About the third or fourth week the mother noticed that the child could not put the right foot to the ground, and that it cried night and day. The ankle-joint was found to be red, swollen, and very painful. Three or four days later the right wrist was also affected. The child had temperature 103°, the local temperature of the right wrist being 103·5°. Fifteen days after this acute fever the child appeared very weak and anæmic; the foot was almost well, but the wrist still remained red and painful. Salicylates had no effect upon the condition, which was treated with compresses of cotton wool and mercurial unguents. In three weeks the joints were quite cured.

No. X (Deutschmann, 'Arch. für Ophth.,' 1890, p. 107, Case 1).—A boy 3 weeks old, suffering from ophthalmia neonatorum. This was severe and complicated by diffuse keratitis.

Twelve days after the onset of the conjunctivitis the child had right otorrhœa, and at the same time swelling of the right wrist and left ankle. The child subsequently succumbed to a cerebral condition following the otitis. No account is given of any examination of the joints.

No. XI (Deutschmann ('Archiv. für Ophth.,' 1890, p. 107, Case 2).—An infant 3 weeks old affected with ophthalmia neonatorum, in the course of which it was seized with an inflammation of the left knee. Gonococci were found in the secretion from the eyes, but could not be found in the vaginal discharge of the mother. A small quantity of fluid was drawn off from

the knee, and also found to contain gonococci. No other micro-organism could be found.

No. XII (S. Lindemann, 'Beiträge zur Augenheilkunde, June, 1892, No. V, p. 30).—Child born December 6th, 1891, was brought to the Polyclinic on December 11th suffering from double purulent ophthalmia. After about three weeks the eyes had so far recovered that treatment was discontinued. On January 1st, 1892, the left knee-joint became considerably swollen, greatly reddened, and hot to touch. The joint was semi-flexed, and pain was caused by attempts to straighten it. The hollows on the sides of the patella were filled up, and the joint was painful to touch. Temperature remained normal whilst under observation. The secretion from the eye was examined and found to contain a few typical gonococci. On January 7th, 1892, the knee-joint was punctured and blood-stained fluid withdrawn. In the cells of the joint-secretion diplococci were recognised. The joint was again punctured on January 9th, and an attempt made to cultivate the gonococcus, but with only partial success. The termination of the case is not reported.

No. XIII (Morax, 'Progrès Médicale,' Oct. 22nd, 1892).—A girl of 7 years, admitted for purulent ophthalmia of the left eye with lesions of the cornea. This patient had been inoculated from the finger of a child of four, who was shown to be suffering from vulvo-vaginitis. Typical gonococci were found in the purulent secretion.

Ten days after the onset the patient complained of pains in the larger joints, chiefly in the left knee. The skin was hot and there was slight fever. The next day the left knee was swollen, with well-marked effusion, a condition which lasted more than a week. It was treated with rest and the joints enveloped in cotton wool. Ten days after the commencement of the inflammation the girl could walk.

No. XIV (Escherich, 'Jahrbuch für Kinderh.,' Oct., 1893).—A new-born male child, badly developed, was noticed three days after birth to have gonorrhœal ophthalmia in the right eye.

In the course of the third week the left knee was swollen. On admission the left knee was very swollen and held in a position of flexion. After a week's rest in a splint the effusion

in the joint was completely absorbed. Then there was found a moderate swelling of the condyles of the femur. At the end of fifteen days the arthritis and the ophthalmia were completely cured.

No. XV (Hoëck, 'Wiener klin. Woch.,' Oct. 12th, 1893, p. 736, Case 1).—M. S—, a female infant, born January 13th, 1893, came under observation seven days later for ophthalmia neonatorum. The ophthalmia was very severe, there being a thick discharge in which gonococci were found. In spite of repeated douches with permanganate lotion and swabbing with a solution of silver nitrate (2 per cent.) the inflammation persisted, and led to perforation of the cornea with prolapse of the iris.

A month after admission on February 25th there was an abrupt rise of temperature and great pain and tenderness in the joints of both lower extremities. The next day the left knee was very swollen and presented distinct fluctuation. Two days later, as the pyrexia was maintained, the joint was aspirated and about 2 c.c. of sero-purulent fluid drawn off. This was found to contain numerous pus cells, in the interior of which masses of gonococci could be seen. The cultivations upon serum-agar yielded positive results. A second aspiration gave the same results.

On March 18th the left hip was very swollen, and presented abnormal mobility. The head of the femur appeared to be lifted out of the articular cavity; the mobility became more and more striking. The leg assumed the attitude of extreme adduction, flexion, and external rotation. The distinct projection of the trochanter on the outer side led to the conclusion that the epiphysis was separated.

The child succumbed on April 15th to an attack of bronchopneumonia. The lesions in the eye were very marked; the anterior chamber was destroyed; the lids were swollen and covered with a yellow crust; the left cornea was opaque, and in its upper half there was a linear scar. The right nasal fossa was filled with pus. The left leg was flexed at the knee and hip. In the left knee there was a little muco-purulent fluid, and the synovial membrane was slightly swollen, œdematous, and pale. The right knee was normal. In the left hip there was slight swelling, with intense injection of the synovial membrane. The acetabulum was partly filled up. The round ligament was de-

stroyed, and under the anterior superior spine a new cavity was formed. There was congenital dislocation of the right hip also.

No. XVI (Hoëck, 'Wiener klin. Wochen.,' October 12th, 1893, p. 736, Case 2).—M. K—, born April 22nd, was admitted on April 30th, 1893, with severe ophthalmia, gonococci being found in the pus. The child improved until May 20th, when the temperature rose to 102.5° . A small swelling appeared in the right ankle, and on the following day there was distinct fluctuation behind the external malleolus. This swelling disappeared after the joint had been fixed in plaster of Paris. On the 24th the temperature again rose to 103.8° , and the left ankle became much swollen. This swelling subsided and the temperature fell; but a week later there was again a slight rise in the temperature, and the right elbow and wrist became swollen. In the meantime the ophthalmia had been cured. By June 26th the swellings of the joints had subsided and the patient was discharged to attend as an out-patient. The child was four weeks old before the arthritis developed, so umbilical infection was considered out of the question. There were no traces of hereditary syphilis and no evidence of any other disease. These were the only two cases Hoëck had seen in four years complicated with arthritis.

No. XVII (Sobotka, 'Prag. med. Woch.,' 1893, p. 582).—A boy 5 weeks old. On the third day after birth the child suffered from purulent conjunctivitis. Both eyelids were œdematous, the conjunctivæ injected and the corneæ ulcerated. There was a thick discharge from both eyes. A fortnight later the child presented a small circumscribed swelling on the ulnar side of the left wrist. This was red and tender, and three days later showed distinct fluctuation. The wrist-joint was swollen, so that its natural power was lost. At the same time the right ankle was inflamed, and abscesses appeared on the outer malleolus and the radial side of the left wrist. Two of the abscesses were opened. On admission there was thick purulent discharge from both eyes. On the left side the elbow-joint and wrist were inflamed; on the right the shoulder, elbow, and wrist were all swollen, red, and tender. Besides the abscesses already mentioned in the left wrist there was a fluctuating swelling on the inner side of the left elbow, and a similar abscess on the ulnar

side of the right wrist. In the lower extremities both ankles and right knee were swollen, and an abscess appeared over the external malleolus of the left ankle. There was also a small abscess of the size of a walnut in the subcutaneous tissue under the upper margin of the ilium about the centre of the crest.

The right hip and knee were flexed and the upper extremities strongly adducted. Passive movements caused acute pain, but there were no definite signs of effusions into the joints. From the pus of one of these subcutaneous abscesses gonococci and streptococci were found, but pure cultures could not be obtained. After incision the abscesses healed up, and the swellings in the joints subsided about three months after the onset.

No. XVIII (Moncorvo, 'La Médecine Infantile,' July 15th, 1894).—A female infant, aged 3 months when first seen, began to suffer from inflammation of the left eye three days after birth, and this spread to the right eye shortly after, and was accompanied by swelling of the lids and a yellow discharge. After a few days, on undressing the child the mother noticed a yellow discharge from the vulva. Under antiseptics the discharge from both eyes and vagina had ceased and only a redness of the conjunctivæ remained. About three weeks before seeking further advice the mother noticed the child cry when moved, and found the elbows, wrists, knees, and ankles red and swollen. Some of the joints had already recovered, the right knee remaining the worst. The child also presented the signs of hereditary syphilis. The child was treated with iodide of potassium and quinine. The inflammation of the joints subsided in the course of a fortnight. The mother admitted having a vaginal discharge before her delivery.

No. XIX (Haushalter, 'Revue Mens. des Mal. de l'enfance,' October, 1895).—A girl, 28 days old was admitted on June 1st, 1895. The child had suffered from purulent ophthalmia three days after birth. This was very severe and led to total blindness. Three and a half weeks after birth the mother noticed a swelling of the left wrist, and two days later there was a swelling of the right knee. On admission there was a marked swelling of the left wrist involving the dorsum of the hand. On the same side there was some swelling of the front of the forearm, apparently due to an inflammation of the tendon

sheaths. On flexing the wrist on the forearm there was distinct sensation of creaking in the joint. The movement caused acute pain. The right knee formed a uniform round swelling. There was great distension of the synovial membrane by fluid, and distinct fluctuation. The fluid aspirated from the joint was not purulent, but contained numerous polynuclear leucocytes. A week later the swelling of the left wrist had subsided, the right knee was very much swollen, but fluctuation was still obvious. Purulent discharge from the eyes was much less. At the end of three weeks there was hardly any fluid in the right knee, but there was some enlargement apparently due to swelling in the bony extremities. The child was then discharged as cured. From the fluid obtained from the right knee gonococci were cultivated in beef broth, but re-cultivation upon the ordinary media was found impossible. Inoculation of the cultures in the bouillon into the peritoneal cavity of a guinea-pig had no effect.

No. XX (Griffon, 'Presse Med.' No. 15, 1896).—A child three weeks old was admitted for purulent ophthalmia which was noticed a few days after birth. On admission the child had both double purulent ophthalmia and vulvo-vaginitis. The day after admission the wrist became swollen. The right wrist was flexed upon the forearm, the whole region was swollen, without any alteration in the colour of the skin, or elevation of local temperature. The dorsum of the hand was cedematous, subcutaneous veins being enlarged. Any movement of the joint caused acute pain. The right hip was flexed upon the abdomen, and could not be extended without great pain to the patient. The leg was flexed upon the thigh.

On examining the hip a distinct fluctuation could be felt behind the great trochanter, and the synovial membrane of the joint appeared to be distended with fluid. After a short rest this effusion quickly disappeared. The cedema and swelling of the right wrist subsided when the joint was fixed on a wooden splint. A week after admission the child's temperature rose to 103° F., and persistent vomiting and diarrhoea set in. Two days later the wrist, though not so swollen, was more deformed. The hand lay useless, slightly flexed upon the forearm. The flexor and extensor sheaths were both distended. There was a fluctuating swelling of the forearm near the styloid process of the

ulna. The hips remained flexed and adduction was limited. Temperature at this stage was subnormal. Twelve days after admission the child died. At the post-mortem examination a thick, creamy, viscid fluid was obtained from the fluctuating swelling on the forearm. The synovial membrane of the right wrist, which appeared to be in communication with the swelling, was very little altered, perhaps a little thick. The lesions were chiefly peri-articular, the articulation being comparatively free. In the right hip the lesions were mainly articular. The capsule was found to contain a large quantity of very thick pus, the peri-articular tissues appearing healthy. The articular cartilages had ulcerated in places, but in the main had preserved their smooth aspect. The synovial membrane itself was smooth, and not injected. The round ligament was destroyed. There was no appearance of the capsule having been ruptured. The other joints were healthy. The bacteriological examination during life showed gonococci in the pus from the eye and vagina, but pus aspirated from the joint yielded nothing but staphylococci. At the autopsy the pus from the wrist and hip was examined and cultivated, and undoubted gonococci were found on the microscopic examination of the pus from these joints, but only staphylococci could be cultivated therefrom. No gonococci were found in the blood microscopically, and the cultures from the blood remained sterile.

No. XXI (E. M. Tyrrell, 'Med. News,' March 7th, 1896, p. 271).—A coloured woman suffering from discharge and with a well-defined history of gonorrhœa, gave birth in hospital to a well-developed female child. The child's eyes were carefully cleansed and preventive treatment constantly applied. Four days after birth slight puffiness and redness of the lids of one eye commenced, and by the evening, in spite of hourly treatment, the lids of both eyes were enormously distended, and slight pressure caused pus to spurt from under them.

Four days after the appearance of the ophthalmia the wrists and dorsum of both hands were slightly swollen, the left being the worse. They were bathed in a hot saline solution, but the swelling continued until it reached from the finger tips to the elbows, and the skin of the wrists and forearms was œdematous.

The child appeared uncomfortable without indications of severe pain, except for a few minutes at a time.

Applications of a 10 per cent. preparation of ichthyol with belladonna were applied, and the hands and arms were bandaged.

Five days later the swelling had disappeared; the eyes in the meantime had yielded to treatment. At the end of three weeks the patient was discharged in good condition, though the ophthalmologist continued the treatment at the patient's home.

No. XXII (Ashby and Wright, 'Diseases of Children,' 1896).—"We have seen an infant a few weeks old in which a stiff flexed wrist remained as the result of what was described as "erysipelas of the hand." The swelling of the hand was noticed on the evening of the day the child was born, and it had also purulent ophthalmia."

No. XXIII (Berenstein, 'Centralb. für p. Augenheilk,' March, 1897, p. 84).—The case was that of the first child of an unmarried girl of nineteen years suffering from a vaginal discharge. The child, born at full time and strongly developed, was until the fifth day perfectly healthy, but on that day the right, and on the seventh day the left eye were seized with typical ophthalmia neonatorum. In the freely secreted pus numbers of Neisser's cocci were demonstrated. On the fifth day of the disease (*i. e.* the tenth of the child's life) the mother noticed a swelling of the right wrist, and two days later the knee of the same side was seized. The general condition was febrile. The joints were red and felt hot; handling of them made the child cry loudly. The knee was held flexed. Berenstein could not feel fluctuation. An exploratory puncture was "unfortunately" not allowed by the mother. The heart-sounds were clear. The ophthalmia recovered by the end of the tenth week of the disease without complications in either cornea or iris. The swellings of the joints lasted somewhat longer, but disappeared with equal completeness. The treatment used was painting with iodine and warm baths.

Note.—I have to thank my dresser, Mr. Stoëhr, for assisting me in obtaining several of these references.

Table of Cases, showing time of onset, joints affected, duration of the attack, and result.

Observer.	Age.	Onset of ophthalmia.	Onset of joint disease.	Joints affected.	Date of subsidence.	Result.
Lucas	18 days	2nd day	12th day	Left knee severely, wrist slightly	6 weeks	Complete recovery.
Davies-Colley	14 weeks	4th day	13th week	Left knee	5 weeks	"
Lucas	1 month	2nd day	12th day	"	1 month	"
Fendick	3 weeks	3rd day	3rd week	"	Not stated	Recovering when reported.
Debierre	Not stated	Inoculated from younger sister	12th day after inoculation	Left elbow and wrist	3 weeks	Recovery.
Widmark	32 days	16 days after birth inoculated from another child	16th day of disease	Right knee and foot	14 days	"
Zatvornitski	Newly born	Shortly after birth	4th day	Right elbow and wrist and left ankle	10 days	"
Darier	4 years	—	3rd week of ophthalmia	Metacarpo-phalangeal joints of right hand	20 days	"
"	2 years	—	3rd or 4th week	Right ankle and right wrist	3 weeks	"
Deutschmann	3 weeks	Not stated	12 days after onset	Right wrist and left ankle; also right otorrhoea	—	Died from cerebral condition following otitis.
"	3 weeks	Not stated	—	Left knee	—	—

Lindemann	3 weeks	Not stated	26 days after birth	"	—	—
Morax	7 years	Inoculated from child of four	10 days after onset	"	10 days	Could then walk.
Escherich	3 weeks	3rd day	3rd week	"	15 days	Complete recovery.
Hoëck	7 days	Not stated; treated on 7th day; right cornea sloughed	5th week after birth	Left knee, left hip; knee aspirated twice; both joints suppurated	—	Died of broncho-pneumonia after 3 months.
"	8 days	Not stated	1 month after birth	Right ankle, left ankle, right elbow and wrist	5 weeks	Recovery.
Sobotka	5 weeks	3rd day	14 days	Left wrist, right ankle, right shoulder, elbow, and wrist	3 months	Recovery after suppuration; gonococci and streptococci found.
Moncorvo	3 months	3rd day; a few days later vulvitis; also hereditary syphilis	2 months	Elbows, wrists, knees, and ankles	14 days	Recovery.
Haushalter	28 days	3rd day	3½ weeks after birth	Left wrist, right knee	3 weeks	"
Griffon	3 weeks	Few days after birth; also vulvo-vaginitis	3rd week	Right wrist, right hip; also tendon sheaths	—	Died 12 days after onset; suppuration; gonococci and staphylococci found.
Tyrrell	Born in hospital	4th day	8th day after birth	Wrists	5 days; discharged in 3 weeks	Recovery.
Aslby and Wright	Few weeks	Not stated	Evening of day child was born	Wrist; "erysipelas of hand"	—	Stiff and flexed when seen.
Berenstein	Newly born	5th and 7th days	10th day after birth	Right wrist and right knee	5 weeks	Recovery.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. xi, p. 47.)