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THE DUCT SIGN IN MUMPS *

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An epidemic of mumps among the students of the university during the academic year 1914-1915 gave us an unusual opportunity to watch from day to day quite a number of patients sent to the contagious hospital for treatment. Mumps is a disease which is usually seen but once by the attending physician and, very commonly, the diagnosis is made by some member of the family at the time of an epidemic. This may explain why the sign I wish to describe has not attracted general attention. The difficulties in the differential diagnosis of mumps are so slight that it would seem hardly necessary to describe a new sign or one which may have been fully recognized before, but which, as seen by us, has not found its way into the textbooks. There are, however, times when swellings on the cheeks not due to specific parotitis offer some difficulties in diagnosis. The duct sign may prove to be of considerable value in settling the question.¹

It is a routine practice on my service at the contagious hospital to examine for enanthems as carefully as for exanthems, and to record the findings whether positive or negative, and to note any peculiarities. My attention was called to a red spot on the buccal mucous membrane at the opening of Steno's duct in a case of mumps which entered the hospital Nov. 28, 1914. I did not recall ever having observed any change in the ducts in mumps before this time, and decided to watch for its occurrence in other cases. Since that time, notes have been made on fifty-seven hospital cases, a sufficient number—if the sign has any constancy—to establish it as characteristic of the disease. It is not surprising that this sign has been quite

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1. Several authors refer to swelling of the mucous membrane at the opening of Steno's duct; Carr: *Practice of Pediatrics*, 1906; Cotton: *Medical Diseases of Infancy and Childhood*, 1906; Rochford: *Diseases of Children*, 1912; Feer: *Lehrbuch der Kinderheilkunde*, 1914.

Doubtless many have observed this duct involvement and have utilized it as a diagnostic point, but for some reason its significance has been considered so slight that the very large majority of standard texts make no mention of it.

generally overlooked because the spot is so small, is often hidden by the teeth and is usually single. If seen, it would, probably, not excite much attention because of its size. Frequent mention is made of the mouth cavity in mumps in the texts, but it is usually described as being negative.

DESCRIPTION OF THE DUCT SIGN

In a case of mumps, if the buccal mucous membrane is well separated from the teeth with a spoon handle and viewed in a good light, the orifice of Steno's duct on the affected side or sides will present a reddened spot measuring from 1 to 2 mm. in diameter. The duct will usually be found to project beyond the surface of the mucous membrane from 1 to 3 mm. In other words, the duct becomes teatulated. The duct is edematous and is usually pale, as a whole, thus accentuating the red central spot which, at times, gives the appearance of a minute ring because of the central opening which may appear darker. In some cases the greater part of the teating is slightly injected. Minute hemorrhagic points may be seen² scattered over an area surrounding the duct as great as 2 cm. in diameter. The orifice of the duct is tumefied and from it, at times, may be seen to exude a limpid fluid.

The involvement of the duct is a progressive and retrogressive change. The spot usually appears first and is followed by teatulation with retrogression in the reverse order.

The Red Spot.—The redness varies in shade from a faint pink to a deep inflammatory red; in many cases it never progresses to the deep red stage. As the swelling of the parotid gland recedes, the spot becomes paler and finally disappears. The spot develops early in the disease and, in all probability, precedes in most cases the observable swelling of the parotid gland, as witnessed by the presence of the spot on the unaffected side before the parotid swelling on that side appears (Case 8 [3933]).

The opening of Steno's duct, normally, is more marked in some persons than in others. The slight increased depth of color in such individuals is definitely not inflammatory and is easily differentiated after the duct sign is once seen. In a series of sixty-eight normal persons, children and adults, the duct opening showed a faint but distinct pink color, differentiating it from the surrounding tissues in 14 per cent. of the cases.

The Teatulation.—Under normal conditions, at times, Steno's duct projects beyond the buccal mucous membrane. The opening of the duct, however, is not inflamed and in mumps when such a duct is

2. Case 7 (1836) herein described. In one case yellowish spots were observed, Case 2 (1734).

present, if it is watched closely, it will be seen to undergo a definite change throughout the course of the disease. Teatulation does not always occur. In Cases 9 (4702) and 10 (4733) only the red spot was seen. A careful examination of the ducts in a series of sixty-eight normal persons, children and adults, one or both the ducts projected beyond the mucous membrane in 37 per cent.

The Duct Pallor.—The duct is usually pale, the pallor so well known in the ordinary mucous membrane swelling of the mouth. At times, this pallor gives the impression of a pale bluish areola surrounding the central red spot.

Duct Congestion or Injection.—This is described in Case 1836. In this case distinct hemorrhages were seen and seemed to be a part of the progressive change. Small hemorrhagic spots on the buccal mucous membrane are not uncommonly seen in children from traumatism—biting the cheeks—and it is possible that this patient may have bitten the projecting mucous membrane. The duct on this side projected fully 3 mm. and the ducts on both sides could be seen to run in between the upper teeth when the cheeks lay against them.

REPORT OF CASES

CASE 1 (1550).—Nov. 28, 1914. Male student, aged 22; second day of disease. The patient walked into the hospital. At this time he had swelling and tenderness in both parotid regions. The salivary opening on the left cheek was reddened. Patient had a temperature of 102 F. Later, the temperature reached 104 F. and he had pain in the pelvis which was referred to the testicle next day. No further observations were made in this case.

CASE 2 (1734).—March 10, 1915. Student, aged 20; first day of disease. Slight pain at the angle of the right jaw. There was no enlargement of the parotid, but there was slight tenderness on pressure over the angle of the right jaw.

March 11, The left parotid is only slightly reddened. The duct projects 3 mm. The right duct is not red nor does it project; it is flat. The left parotid is distinctly swollen. Patient was discharged on fourth day as a one-sided case of mumps.

March 18. Patient returns. The left duct is now red at the orifice and projects 3 mm. above the surface of the buccal mucous membrane. There is some edema of the duct and surrounding mucous membrane. About the duct on the right side are numerous miliary yellow spots.

March 19. The left parotid is distinctly swollen. Submaxillary glands not involved. Both papillae bulge 2 mm. Only slight redness of duct opening present. The little spots around the right duct are still present.

March 24. Left duct shows swelling, but practically no redness. Highest temperature, 102 F.

CASE 3 (1735).—March 10, 1915. Student, male, aged 22; second day of disease. Left parotid much swollen and tender. Right negative. Papillae of both ducts swollen and reddened.

March 11. Both ducts are reddened, particularly the right, and both project 1 mm. above the surface of the mucous membrane. The left opening is faintly seen and slightly dilated. The parotid on the right side is distinctly enlarged, the left only slightly.

March 17. Swelling of both parotid regions has about returned to normal. The opening of Steno's ducts still show slight swelling (tumefaction) more marked on the right. The papillae show a little redness.

March 18. The left duct projects slightly. The center is purplish and very edematous. The anemia around the duct measures 1 cm. in diameter, giving an edematous appearance. On the opposite side the redness has disappeared and the entire buccal mucous membrane appears swollen. The external swelling has almost entirely disappeared on the right side. It is still present on the left side.

March 19. There are dark purplish spots at the center of the duct opening on both sides. The left duct is flat; the right still projects and shows slight edema.

CASE 4 (1743).—March 15, 1915. Student, aged 22; second day of disease. Complained of continual aching in right parotid region. Right parotid swollen and tender. Right duct swollen with pinpoint redness at orifice of both ducts. Submaxillaries negative.

March 19. Duct on right side projects an area of 6 mm. in diameter. This area is edematous and has a bluish cast. There is an edematous center seen on the left side but it is not so marked.

March 29. Swelling at duct orifices almost gone, practically no redness. Highest temperature 104 F. Discharged fourteenth day.

CASE 5 (1823).—April 30, 1915. Male, aged 19; second day of disease. Examination showed a well developed case of mumps, right parotid. Both papillae were enlarged.

May 2. Left parotid swollen. Duct projects. There are three pinpoint openings pointing outward, each showing a distinct reddening. The right duct shows no reddening, it is only swollen. Highest temperature 100 F.

CASE 6 (1834).—May 8, 1915. Patient, a nurse, second day of disease, entered contagious service with marked swelling and tenderness of the left parotid and a suggestion of swelling in right. There is no submaxillary swelling. The left duct shows a round bulging which projects from 1.5 to 2 mm. beyond the surrounding mucous membrane. The projection itself is not injected. In the center at the duct opening there is a small reddened depression. The right duct shows a similar picture.

May 11. Both cheeks are now characteristically swollen. The duct of the right side projects about 2 mm. At the center of the duct opening there is a circumscribed deep red point. The buccal mucous membrane is edematous, particularly in the space beyond the center of the duct. The red spot at the opening of the duct on the left side, the first involved, is becoming paler.

May 13. Submaxillary glands are now swollen. The patient has been having severe headaches for the past two days. No note on ducts.

May 19. There is still slight swelling of the left parotid. The right duct is negative. The left duct is still slightly elongated. The center is dull red.

May 20. The redness has disappeared and there is no evidence of congestion in the duct region.

Final Note. In this case, what commenced as a mild attack of mumps became complicated on the fourth day with severe headache which was not relieved by medicine and persisted for three days. The temperature reached 102 F. The patient complained of abdominal pain during this time, but we were unable to attribute it to ovarian or pancreatic involvement.

CASE 7 (1836).—May 11, 1915. Young woman, aged 20. Two days ago complained of soreness and swelling of right side of face. Yesterday both sides were swollen. This morning the right side shows only slight swelling. The left is characteristic. The right duct is very red at the center, an area of 2 mm. in diameter. There is slight projection or teating of the duct. The left duct projects further, fully 3 mm. The opening is very red and circumscribed about the orifice. Scattered over an area 2 cm. in diameter there are numerous small pointed red spots (hemorrhages) where the buccal mucous

membranes are allowed to come against the teeth. The duct runs in between the teeth like a teat about 1 cm. in length.

May 13. Submaxillaries now involved.

May 17. Parotid and submaxillary swellings almost gone. Slight pigmentation of the ducts present.

May 19. Right duct negative. Left is still elongated; there is a dull red spot at the orifice.

May 22. No injection of orifices of ducts or surrounding mucous membranes.

CASE 8 (2159).—Dec. 15, 1915. Nurse, aged 23; second day of disease. Examination showed slight swelling of left side of face. Duct slightly enlarged but not red. Next day right parotid swelled.

December 17. Right duct not enlarged or reddened. Left duct projects, orifice slightly red. Highest temperature 103.8 F.

CASE 8 (3933).—Jan. 11, 1918. Male student, aged 19; second day of disease. Left parotid swelling marked, tender. There is no swelling of the right side of the face. The left duct is very edematous and inflamed, red. The right duct is only slightly enlarged, pink orifice.

January 22. Since last note the right parotid and duct have been characteristically involved. The swelling on the right side is disappearing while that on the left continues to be smaller and the left duct to be smaller and its orifice red. The right duct is normal.

January 24. Both ducts are normal. Highest temperature in this case, 102.2 F.

CASE 9 (4702).—May 7, 1919. A. M., female, aged 26. Patient presents herself at the clinic four hours after she first observed any symptoms, slight swelling of right face. She recalls that at bedtime there was a little soreness in her left cheek. Examination showed the right duct enlarged, projecting and red and the right parotid slightly swollen. Later on the left was involved.

CASE 10 (4733).—May 29, 1919. Young woman, aged 23. Two hours after she first noticed soreness and swelling in right jaw. There was difficulty in swallowing. The duct at this time was not swollen, but signs of beginning inflammation of the duct orifice were seen (redness) later on. No further observations were made on this case. This is the earliest primary involvement we have observed. Case 9 (4702) is the next.

CASE 11 (5189).—March 29, 1920. Male, aged 19. Came to clinic on the ninth day of the disease. There was marked swelling of both parotids. The left was the first involved. Submaxillaries were negative. Steno's ducts are both teatulated and both orifices are very red. The red area measures 2.5 mm. in diameter. The ducts project 2 mm. Around the reddened areas there is a bluish areola. There are no punctate spots in these areas. The openings of the submaxillary glands are negative.

March 31. Ducts the same.

April 1. Parotid swellings have subsided.

April 3. Ducts: Both orifices are still red, 2 mm. in diameter. There are a few bluish spots in these areas. The redness is becoming less marked.

April 4. Ducts: The redness is much paler; only the orifice itself is now red. Teatulation remains about the same as at entrance. All parotid swellings are gone.

April 5. Ducts: Practically all redness has disappeared. Teatulation the same.

April 10. The ducts do not look so prominent; it is almost impossible to distinguish them.

April 12. Ducts and parotids are entirely negative. Teatulation has disappeared. This was a very marked case of mumps; large swellings of the parotid and marked duct signs. The temperature did not go above 98.6 F. the entire time he was in the hospital, but he entered on the ninth day of the disease.

The fifty-seven cases are here briefly tabulated.

ANALYSIS OF CLINICAL HISTORY OF FIFTY-SEVEN CASES OF MUMPS

Case Number	Date	Age	Sex†	Day of Disease First Seen	Teatulation of Duct		Reddening of Orifice		Highest Temperature
					Right	Left	Right	Left	
1550*	11/28/14	22	♂	2	—	—	—	+	102.0
1618	1/17/15	20	♂	2	+	0	+	0	102.0
1683	1/25/15	18	♂	3	+	—	+	—	100.8
1683	2/ 3/15	18	♂	2	+	+	+	+	103.0
1684*	2/ 3/15	20	♂	3	0	+	0	+	104.2
1682	2/ 6/15	18	♂	2	+	+	+	+	99.8
1680	2/ 8/15	22	♂	1	+	0	+	0	99.0
1701	2/24/15	22	♂	1	+	+	+	+	99.0
1697	2/22/15	22	♂	1	+	0	+	0	104.4
1700	2/22/15	23	♂	1	+	+	+	+	101.0
1711	3/ 1/15	18	♂	2	+	0	+	0	98.6
1735*	3/10/15	22	♂	2	+	+	+	+	100.8
1734*	3/10/15	20	♂	1	+	+	+	+	101.6
1743*	3/15/15	22	♂	1	+	+	+	+	103.4
1747	3/16/15	21	♂	2	+	+	+	+	99.0
1765	3/20/15	24	♂	—	0	+	0	+	101.0
1794†	4/11/15	23	♂	2	+	+	+	+	102.4
1823*	4/30/15	19	♂	2	+	+	0	+	100.0
1834*	5/ 8/15	21	♂	2	+	+	+	+	102.0
1836*	5/11/15	28	♂	2	+	+	+	+	98.6
1889	6/10/15	5	♂	2	+	+	+	+	Out-patient
2159*	12/17/15	23	♂	2	+	+	+	+	103.8
2421	4/11/16	18	♂	2	+	+	+	+	103.0
3898	12/12/17	21	♂	2	+	+	+	+	104.0
3910	12/14/17	23	♂	12	+	+	+	+	101.8
3983*	1/11/18	19	♂	2	+	+	+	+	102.0
4020	3/18/18	19	♂	2	0	+	0	+	98.6
3989	2/23/18	21	♂	4	0	+	0	+	99.0
3961	2/28/18	21	♂	2	+	+	+	+	99.0
4066*	4/17/18	21	♂	8	+	+	+	+	101.2
3996‡	5/ 3/18	23	♂	7	0	+	0	+	104.0
4107	5/26/18	Adult	♂	—	+	+	+	+	103.6
0519	6/19/18	Adult	♂	3	+	+	+	+	Out-patient
4138	6/21/18	24	♂	2	+	+	+	+	100.2
4193	8/27/18	5	♂	3	+	+	+	+	104.0
4213	9/17/18	35	♂	1	+	0	+	0	100.0
4457	12/27/18	25	♂	2	+	+	+	+	103.4
4490‡	1/11/19	19	♂	2	+	+	0	0	99.2
4514	1/30/19	19	♂	2	0	+	0	+	99.6
4551	2/18/19	21	♂	1	+	0	+	0	100.0
4578	2/28/19	24	♂	1	0	+	0	+	98.8
4583	3/ 4/19	23	♂	2	+	+	+	+	102.2
4598‡	3/10/19	20	♂	1	+	+	+	+	98.6
4620	3/22/19	19	♂	2	+	0	+	0	100.2
4630	3/27/19	21	♂	2	+	+	+	+	102.4
4634	3/28/19	22	♂	1	+	0	+	0	99.6
4650	4/ 7/19	21	♂	2	+	+	+	+	102.0
4655	4/10/19	21	♂	2	+	+	+	+	100.0
4686	4/29/19	22	♂	1	+	+	+	+	99.6
4701	5/ 6/19	19	♂	1	+	+	+	+	99.8
4702‡	5/ 7/19	26	♂	1	0	+	0	0	102.2
4714‡	5/15/19	21	♂	2	+	+	+	0	102.0
4730	5/27/19	24	♂	2	0	0	+	+	100.0
4733‡	5/29/19	23	♂	2	0	0	+	0	99.0
4753	6/15/19	25	♂	2	+	+	+	+	100.0
4800‡	7/23/19	14	♂	2	0	0	0	0	99.0
5189*	3/29/20	19	♂	9	+	+	+	+	99.0

* Abstracted in this report.

† In this column, ♂ indicates male, and ♀ female.

1. The discoloration or faint redness of the orifice remained after the swelling disappeared.
2. The parotid swellings had disappeared when this patient entered the hospital for right sided orchitis. The left duct was slightly teatulated. While of interest, this case should not be counted. It simply shows that the duct sign may disappear before the complications of the disease are over.

3. Only one observation was made on this patient by a new intern unfamiliar with the sign. This case should not be considered.

4. A limpid mucus discharge was seen to flow from each duct.

5. The left parotid in this case did not become involved. The slight teatulation may have been normal.

6. A case of submaxillary mumps. The parotids never became involved. There was no reddening of the submaxillary ducts.

7. Observation made four hours after the first swelling of the face was noticed. There had been slight soreness the night before.

8. Observation was made two hours after the patient felt swelling or discomfort in the right jaw. There was no swelling of the ducts. This is the earliest primary case we have observed.

It will be seen that the presence of the duct sign is uninfluenced by the degree of fever. The remarkable involvement of the parotids which may take place in this specific process without an expression in the temperature (Case 11 [5189]) is well known. The same is true of the changes at the periphery of the duct as described above. The sign occurs early in the disease, probably ahead of the parotid swelling in most cases, and persists throughout the course of the disease.

Submaxillary Mumps.—Thus far we have been unable to see any changes in the ducts in submaxillary mumps or parotid mumps in which the submaxillary glands were involved.

Whether the duct sign is pathognomonic of parotid mumps or whether it may occur in any acute inflammatory involvement of the parotid gland, I am unable to say. I have observed a number of face swellings in which the question of mumps arose, two of these acute, in which there was no involvement of the ducts and which later proved not to be mumps.

CONCLUSIONS

1. The duct sign in parotid mumps is described.
2. The duct sign was present in 96 per cent. of the cases recorded and is probably present in all cases of parotid mumps at some time in the course of the disease.
3. Whether the duct sign is pathognomonic of specific parotitis or is present in other acute inflammatory conditions of the parotid gland has not been determined.
4. Because of the occasional occurrence of teatulation of Steno's duct in a certain percentage of apparently normal persons and occasional redness of its orifice, careful differentiation should be made. The duct sign should be regarded simply as corroborative evidence of parotid gland involvement.