

THE TONSILS AND SCARLET FEVER *

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The observation of many patients suffering with scarlet fever gave me the impression that their fate depended, in part on the anatomic configuration of their throats, and led me to verify this conclusion by statistical study. To this end special charts were printed, and observations were collected, covering certain definite points in tonsil structure. I am indebted to assistant resident physicians and interns in the scarlet fever pavilion of the Willard Parker Hospital, especially to Doctors Cootner, Tolle and Crawford, who made the observations on admission. A large number of the observations were verified or corrected by me on my later visit. It is thought that in this way the observations have greater value as averaging any personal error.

In table 1 are tabulated 154 cases which were observed during my services in 1919 and 1920. This does not represent all the cases seen during that time, as cases in which inadequate observations were made have been discarded. The chart has been prepared showing the sex, age, number of days ill and the condition on admission. "Very sick" describes the condition of any patient with an acute infection who is not so desperately ill that the prognosis is doubtful. Under rash, the number of crosses indicate in a rough way the intensity of the rash. A mild punctate erythematous rash, sufficient to establish a diagnosis of scarlet fever, is indicated by a single cross; two crosses indicate that the rash was well developed; three crosses that the rash was quite intense and four crosses that rash is so intense that the description "boiled lobster" is applicable. By the size of the tonsil is indicated our approximate judgment based in the case of covered tonsils on the amount of bulging into the anterior pillar. By small tonsils we designate a tonsil which is not larger than a filbert or hazel nut; the large tonsils appear to be the size of a walnut or larger. Moderate sized tonsils are intermediate. Tonsils are described as buried when they are covered by the anterior pillar, by a fold of mucous membrane, by a fold of plica or by the posterior pillar. Such tonsils may give the appearance of being concealed behind an iris diaphragm. The major portion of their surfaces is unexposed.

Adhesion to the pillars indicated that on swallowing, the tonsils do not lie free in the fossa but are apparently flush with the pillar and

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TABLE 1.—ANALYSIS OF CASES

Num- ber	Hos- pital Num- ber	Sex	Age, Yrs.	Days Ill	Condi- tion on Admis- sion	Rash	Tonsil Size	Adhesion to Pillar	Com- pressed on Swal- lowing	Lymph Nodes		Differ- ence	Char- acter of Case	Complications and Remarks	Result
										Ante- rior	Poste- rior				
1	2096	♀	12	3	V.S. bronchitis	+++	L	—	—	—	—	—	Mild	Temp. to 101 F. in 4th week.	R
2	2103	♀	15	3	V.S.	++	L	+	+	+	+	—	Mild	Slight adenitis.	R
3	2101	♀	4	3	V.S.	+	L	+	+	+	+	—	Moderate	Adenitis moderate; Temp. 100 F. until 3d week	R
4	2102	♂	2	2	V.S.	++	L	—	—	+	+	—	Moderate	Adenitis; Temp. to 101.8 F. in 2d and 4th weeks	R
5	2111	♀	7	2	V.S.	+	S	—	—	+	+	—	Moderate	Hemic murmur	R
6	2126	♂	29	2	V.S.	++	L	+	—	+	+	—	Moderate	Adenitis; Temp. to 101.8 F. in 2d and 4th weeks	R
7	2140	♀	7	1	V.S.	++	L	+	—	+	+	—	Moderate	Hemic murmur	R
8	2159	♀	9	2	P.D.	++	L	—	—	+	+	—	Moderate	Adenitis; Temp. to 101.8 F. in 2d and 4th weeks	R
9	2172	♂	8	3	V.S.	++	L	—	—	+	+	—	Moderate	Adenitis; Temp. to 101.8 F. in 2d and 4th weeks	R
10	2205	♂	4	?	V.S.	++	L	—	—	—	—	—	Severe	Ethmoiditis; sinus thrombosis; convulsions; Temp. 101.4 F. four days before nodes enlarged	+
11	2231	♀	3	4	V.S.	++	L	+	—	+	+	—	Moderate	Right cervical adenitis.	R
12	2252	♀	7	6	V.S.	+++	S	—	—	+	+	—	Moderate	Right cervical adenitis.	R
13	2281	♀	20	5	V.S.	+	S	—	—	+	+	—	Mild	Cardiac arrhythmia; foot abscess	R
14	2296	♂	6	1	V.S.	++	L	+ tightly encapsulated en- buried en- + encapsulated, buried	+	+	+	—	Severe	Cardiac arrhythmia; foot abscess	R
15	2300	♂	6	4	V.S.	+	L	+	+	+	+	—	Moderate	Abrasion on forehead, fell from bed	R
16	2306	♂	9	?	V.S.	+	S	—	—	+	+	—	Mild	Infected vaccination in 2d week	R
17	2309	♂	5	4	V.S.	+	S	—	—	+	+	—	Mild	Cervical adenitis	R
18	1961	♂	2	2	V.S.	+	S	—	—	+	+	—	Mild	Cervical adenitis; Temp. 103 F. 2d week	R
19	1979	♀	4	2	V.S.	++	L	—	—	+	+	—	Severe	Cervical adenitis; right facial paralysis; bronchopneumonia; diphtheria	+
20	1981	♀	3	2	V.S.	++	L	+	+	+	+	—	Severe	Cervical adenitis; right facial paralysis; bronchopneumonia; diphtheria	+
21	1990	♀	8	3	V.S.	++	L	—	—	+	+	—	Mild	Chickenpox	R
22	2031	♀	7	4	V.S.	++	L	—	—	+	+	—	Mild	Chickenpox	R
23	2035	♂	7	?	V.S.	+	L	—	—	+	+	—	No case?	Pneumonia and diphtheria.	R
24	2037	♂	4	5	V.S.	+	L	—	—	+	+	—	Severe	Diphtheria; discharged against advice	R
25	2052	♀	7	2	V.S.	++	L	—	—	+	+	—	Mild	Adenitis; left peritonsillar abscess, drained	R
26	2053	♂	16	3	V.S.	+	S	+ tonsillectomy tabs	—	—	—	—	V mild	Whooping cough	R
27	2364	♀	14	9	V.S.	—	S	+ tonsillectomy tabs	+	+	+	—	V mild	Whooping cough	R
28	2651	♂	9	3	V.S.	++	L	—	—	+	+	—	Mild	Whooping cough	R
29	2664	♂	7	2	V.S.	++	L	—	—	+	+	—	Mild	Whooping cough	R

TABLE 1.—ANALYSIS OF CASES—(Continued)

Num-ber	Hos-pital Num-ber	Sex	Age, Yrs.	Days Ill	Condi-tion on Admis-sion	Rash	Tonsil Size	Adhesion to Pillar	Com-pressed on Swal-lowing	Lymph Nodes Anterior Posterior	Differ-ence	Char-acter of Case	Complications and Remarks	Result
54	2493	♂	7	2	V.S.	+	L	+	+	..	—	Moderate	Cervical adenitis; Temp. 104 F. 6th day	R
55	2518	♀	9½	2	V.S.	+	M	R + buried L—	..	+	B adherent L free	Moderate	Right cervical adenitis; brady-cardia	R
56	2523	♂	24	1	V.S.	++	M	R—	+	++	R free	Moderate	Adenitis; temperature rose to 101 F. occasionally during convalescence	R
57	2524	♂	5	1	V.S.	++	L	L + buried	..	++	—	Moderate	Adenitis; temperature rose to 101 F. occasionally during convalescence	R
58	2529	♂	9	2	V.S.	++	S previous tonsillectomy	— rem. on R none on L	..	Only on R	On R	Moderate	Temp. 103 F. on 5th day; adenitis	R
59	2559	♀	6	2	V.S.	+++	L	not buried	—	++	..	Severe	Adenoidectomy; tonsillectomy; nephritis; meningitis	†
60	2572	♀	11	2	V.S.	++	L	Buried	—	++	++	Moderate	Double cervical adenitis; L > R	R
61	2584	♀	11	3	V.S.	++	L	L + R—	..	—	L + R—	Moderate	Double cervical adenitis; L > R	R
62	2587	♀	4½	3	V.S.	++	L	+ buried	..	++	—	Moderate	Slight R. cervical adenitis	R
63	2605	♀	12	2	V.S.	++	VS	Almost completely buried	..	+	—	Moderate	Rheumatism (also "e flu"; teeth abscessed and capped	R
64	2612	♀	22	3	V.S.	++	Tonsillectomy	..	..	+	—	Moderate	Developed diphtheria, 6,000 c.c. antitoxin	R
65	2613	♀	2	2	V.S.	++	Mod.	+ buried	+	R++	—	Moderate	Nasal discharge; moderate double cervical adenitis; bilateral	R
66	2520	♂	5	2	V.S.	++	Previous tonsillectomy	—	..	L small	—	Mild	OMP; chickenpox	R
67	2525	♂	4	1	V.S.	++	L	+ buried	+	++	—	Moderate	Herpes (lateral)	R
68	1971	♀	9	2	V.S.	++	S	— buried	—	+	—	Mild	Cervical adenitis on admission; left adenitis, diphtheria;	R
69	1995	♀	5½	3	V.S.	++	S plica	— buried	+	++	—	Mild	Temp. 102 F. 3d week	R
70	1999	♀	12	3	V.S.	++	L plica	+	+	+	L worse	Moderate	No adenitis; foot infection caused rise of temperature	R
71	2002	♀	4	2	V.S.	++	L plica	+	+	+	—	Moderate	Arrhythmia 3d week; acute tonsillitis, double cervical adenitis 3d and 4th weeks	R
72	2003	♀	4	4	V.S.	+	M plica	—	—	—	—	Moderate	Vacillating temperature 2d week	R
73	2023	♀	10	4	V.S.	++	S plica	—	—	++	—	Moderate	No adenitis	R
74	2040	♀	7	7	V.S.	++	L	—	—	+	—	Mild	Wrist arthritis with temperature; 2d and 3d weeks cervical	R
75	2052	♀	17	3	V.S.	++	L	—	—	++	—	Mild		R
76	2091	♀	3½	1	V.S.	++	L	—	—	++	—	Mild		R
77	2106	♀	9	10	V.S.	..	R large L small	R + L— covered with plica — buried	—	++	R > L	Mild		R
78	2129	♀	9	2	V.S.	++	S	— covered with plica and covered with plica	—	+	—	Severe		R

79	9138	Q	22	2	V.S.	++	S	- plica	-	-	-	Mild	Empyema on admission; adenitis	R
80	2152	♂	4	2	V.S.	++	L	+ plica	+	+	L>R	Moderate	Peritonsillar abscess with adenitis; tonsillectomy 2d week	R
81	2165	♀	30	2	V.S.	++	L plica	+	+	+	R larger	Mild		R
82	2179	♀	7	2	V.S.	++	L plica	+	+	+	—	Mild		R
83	2194	♂	22	6	V.S.	++	S plica	+	+	+	—	Mild		R
84	2250	♂	13	2	V.S.	+++	L plica	+	+	+	—	Severe	Marked double cervical adenitis; double OMP and mastoiditis; P. D. 5th day	R
85	2212	♂	6	3	V.S.	++	L plica	- buried	+	+	—	Severe		†
86	2234	♀	21	2	V.S.	++	M partly covered	—	—	—	—	Mild		R
87	2255	♀	7	3	V.S.	++	S almost covered	—	—	—	—	Mild		R
88	2273	♀	5	5	V.S.	++	S buried	+	+	+	R>L	Severe	Adenitis; profuse nasal discharge; tonsillectomy refused 8th day; died 15th day	†
89	2327	♀	2	3	V.S.	++	L plica	+	+	+	—	Severe	Cervical adenitis; nasal discharge; ulcer of mouth	+
90	2544	♂	20 m.	2	P.D.	++	L	+	+	+	—	Severe	Profuse nasal discharge 3d day	†
91	2244	♀	6	2	V.S.	++	M almost covered	+	+	+	—	Moderate		R
92	2268	♀	24	2	V.S.	++	M	+ R tonsil with plica	+	+	—	V mild		R
93	2271	♂	8	2	V.S.	++	Tonsillectomy	..	..	SI	—	Mild	Temperature due to infected hernia	R
94	2272	♀	14	2	V.S.	++	L plica	+	+	few	—	Moderate	Temperature persisted 1 week	R
95	2279	♂	29	2	V.S.	++	M cryptic	+ covered with plica	+	+	—	Mild	Bradycardia	R
96	2294	♀	3½	2	V.S.	++	L	L + R - buried	+	+	L buried	Mild	Developed diphtheria	R
97	2312	♂	22	3	V.S.	++	L plica	+	+	+	R free	Moderate	Peritonsillar abscess 20th day; tonsillectomy under local anesthesia 21st day	R
98	2341	♂	6½	3	V.S.	+	S	+	+	+	—	Moderate		R
99	2360	♂	4½	1	V.S.	+	S	—	+	+	—	Mild	Lateral herpes	R
100	2383	♂	21	5	P.D.	++	M	—	+	+	—	V mild		R
101	2385	♂	24	2	V.S.	++	L plica	+	+	+	R>L	Mild		R
102	2438	♂	10	8	V.S.	+	M plica	—	+	+	—	V mild		R
103	2263	♂	5	4	V.S.	++	M plica	Buried	+	+	—	Mild	Diphtheria	R
104	2293	♂	3	1	V.S. then P.D.	++	L plica	- large crypts	+	+	—	Severe	Bilateral cervical adenitis and bilateral otitis media; died 6th day	†
105	2326	♀	6	1	V.S.	++	Tonsillectomy	..	+	+	—	Moderate		R
106	2361	♂	2	1	V.S.	++	L	+	+	+	—	Severe	Bilateral otitis media; adenitis; profuse nasal discharge; plica incised; frequent Temp. 104 F.	R
107	2374	♂	3	2	V.S.	++	L buried	+ covered	+	+	—	Mild on adm. sev.	Bronchopneumonia, cervical adenitis; death 15th day	†
108	2431	♂	5	4	V.S.	++	Tonsillectomy	..	..	..	—	Mild	Herpes (lateral)	R

TABLE 1.—ANALYSIS OF CASES—(Continued)

Num-ber	Hos-pital Num-ber	Sex	Age, Yrs.	Days Ill	Condi-tion on Admis-sion	Rash	Tonsil Size	Adhesion to Pillar	Com-pressed on Swal-lowing	Lymph Nodes	Differ-ence	Char-acter of Case	Complications and Remarks	Result
										Ante-rior	Poste-rior			
109	2485	♂	8	1	V.S.	++	Tonsil-lectomy L	..	..	..	R < L	Mild	Nasal discharge	R
110	2439	♂	6	7	V.S.	+		+ to ant. pillar	..	+	—	Mild		R
111	3334	♂	12	2	V.S.	++	L ½ buried	..	+	..	..	Mild	Bilaterally exudate, Schick in-travenous +, 25,000 units	R
112	3329	♂	20	3	V.S.	++	L buried	— covered	..	..	..	Moderate	Temp. 99-100 F. for weeks;	R
113	3304	♀	7	2	V.S.	++	VL buried	— covered	..	..	..	Moderate	Intravenously 25,000 units	R
114	3269	♀	8	2	V.S.	++	ML strep. exudate	..	—	..	..	Moderate	Temperature normal 6th day.	R
115	2875	♂	7	3	?	++	L eryptic	..	+	..	..	Moderate	General joint pains 7th day;	R
116	2902	♂	25	3	V.S.	++	L buried	..	+	..	..	Moderate	bradycardia 3 days; sali-cylates; relief	R
117	2904	♀	4	2	V.S.	++	M buried	+	+	+	..	Moderate	Operated for inguinal adenitis	R
118	2884	♂	4½	1	V.S.	..	Previous tonsil-lectomy	..	+	..	..	Moderate	8 days before admission	R
120	3441	♀	3	1	V.S.	++	L buried	..	..	..	..	Moderate	Cervical adenitis L > R; ar-rhythmia; temperature 12 day	R
121	3434	♂	6	1	V.S.	++	L	..	..	..	..	Moderate	Bradycardia lasting until 16th day; nasal discharge; myo-carditis	R
122	2571	♂	13	2	V.S.	++++	L buried	+	+	++	—	Severe	Diphtheria, antitoxin 2d day;	R
123	2604	♂	5	2	V.S.	++	M buried	..	—	+	—	Moderate	albuminuria; bilateral OMP	R
													Infected plastic on hand; large glands drained before admis-sion; chicken pox; nasal discharge; bilateral OMP	
124	2065	♂	7	3	V.S. incised glands on neck on adm.	++	Previous tonsil-lectomy	..	..	—	..	Mild		R
125	2069	♂	2	2	V.S.	++	L buried	—	+	+	..	Severe	Developed measles and chicken pox	R
126	2105	♀	5	4	V.S.	++	L buried by plica covered	+	..	++	..	Severe	Double cervical adenitis; re-quired incision	R
127	2178	♂	5	17	V.S.	At home 17 days	L buried	+	+	+	—	Severe	Nephritis	R
128	2211	♀	6½	1	V.S.	++	L plica	..	..	++	—	Severe	Double OMP; mastoiditis	R
129	2243	♂	16	3	V.S.	++	L eryptic	—	..	+	—	Moderate	Slight cervical adenitis.....	R
130	2307	♂	4½	2	V.S.	+	S buried	—	..	..	R adherent	Moderate	No adenitis; temperature 14 days; developed measles and bronchitis	R
131	2325	♂	3½	3	V.S.	++	M eryptic plica	+	+	++	—	Severe	Measles; cervical adenitis.....	R

132	2346	♂	8	7	V.S.	++	VL S buried	R + L -	++	++	++	..	Moderate	OMP; developed varicella.....	R
133	2364	♀	6	5	V.S. bron.pn.	++	S plica	..	++	++	++	..	Severe	OMP; measles	R
134	2384	♀	14	3	V.S.	++	S buried	..	++	++	L>R	..	Moderate	OMP; general bronchitis.....	R
135	2628	♂	12	1	V.S.	+	Tonsillec- tomy	..	++	++	..	..	Mild	.....	R
136	2637	♀	13	4	V.S.	+	Tonsillec- tomy	..	-	-	..	..	Moderate	Had empyema on admission.....	R
137	2644	♀	10	2	V.S. empyema	++	L fibrous	+	+	+	++	..	Moderate	Temp. 12 day; arthritis re- lieved by acetylsalicylic acid	R
138	2645	♀	30	2	V.S.	++	S buried	..	+	+	L>R	..	Moderate	Temp. normal 5th day.....	R
139	3368	♀	7	2	V.S.	+++	L irreg. Tonsillec- tomy	..	..	..	..	..	Moderate	Peritonsillar infiltration; Temp. normal 6th day	R
140	2317	♂	7	2	V.S.	+++	Follicular exudate	+	+	+	..	..	Moderate	Temp. normal 3d day.....	R
141	3000	♂	12	?	P.D.	+++	bilateral L Hyper- on both S embed- ded, mostly removed L buried hypertroph.	+	..	..	..	..	Mild	Temp. normal 14th day.....	R
142	3016	♂	6	1	V.S.	++	L Hyper- on both S embed- ded, mostly removed L buried hypertroph.	..	+	+	More on left	..	Moderate	Left cervical adenitis 21st day; Temp. up till 24th day; nasal discharge; had had diphtheria 5 days previously, antitoxin 7th day	R
143	3009	♂	2½	3	V.S.	++	..	..	+	+	..	..	Severe	.....	R
144	3101	♂	3½	3	P.D.	++	..	..	+	+	..	..	Moderate	.....	R
145	3131	♀	9	2	V.S.	++	R½ remov- ed; L com- pletely re- moved	..	+	+	+	R remnant L 0	Moderate	.....	R
146	3158	♀	18	6	V.S.	++	..	-	+	+	+	..	Moderate	Erythromelalgia and toxic eczema	R
147	3153	♀	7	2	V.S.	++	L buried	..	+	+	..	..	Mild	Diagnosis indefinite	R
148	3076	♀	2	2	V.S.	++	L buried	..	+	+	..	..	Moderate	Posterior cervical adenitis; Temp. 104 F. on 11th day; in- cised; Temp. continued 7 days Normal on 9th day.....	R
149	3074	♀	7	2	V.S.	++	ML buried cryptic	+	-	-	+	..	Moderate	Temp. normal on 10th day; severe angina	R
150	3036	♀	3	3	V.S.	++	Buried	+	+	+	+	..	Severe	Albuminuria 20 days; Schick 15,000; cervical adenitis; Temp. 106 15th day, normal 26th day; two other unexplained tem- perature rises	R
151	3037	♂	3	5	V.S.	++	L cryptic	..	-	-	..	..	Moderate	Right cervical adenitis devel- oped; Temp. 106 F. on 8th day; cervical nodes observed on 9th day	R
152	3030	♀	15½	4	V.S.	+	M partly buried	..	-	-	-	..	Moderate	Profuse nasal discharge; cervi- cal adenitis required incision; hemorrhage from external jugular vein	R
153	3257	♂	6½	?	V.S.	..	L cryptic	++	++	++	++	L more bur- ied than R	Moderate	.....	R
154	2540	♀	3	3	V.S.	+++	L buried	++	++	++	++	..	Severe	.....	R

adherent to it. In some cases this adhesion is the result of a preceding inflammation; in others it seems to be a congenital or normal conformation. The description "compression on swallowing" or gagging indicates that the tonsil is compressed between the anterior pillar and the superior constrictor of the pharynx when the patient gags or swallows. This observation was thought important as offering a physical explanation of the involvement of the tonsillar lymph nodes as the result of expressing toxins or organisms from the infected tonsil into the lymph stream. Of course, it is appreciated that this condition must vary during the scarlatina, as large tonsils have been seen to be everted by the pharyngeal action on admission and subsequently on becoming smaller they are compressed. This accounts for the late appearance of lymph nodes in some cases. Our observations were made on admission or within from twenty-four hours afterward. By the anterior lymph nodes we designate the deep cervical chain into which the tonsils drain. These lymph nodes lie in the anterior triangle of the neck. The posterior

TABLE 2.—SHOWING EFFECT OF PRIOR TONSILLECTOMY AND OF ADENITIS ON RASH

	All Cases 153		Previously Tonsillectomized 16 Cases (10 complete)		Adenitis 42 Cases		Severe Rash (++++, +++) 11 Cases	
	No.	%	No.	%	No.	%	No.	%
Mild.....	51	33	11	66	4	9	1	9
Moderate.....	73	47	5	32	23	56	6	54
Severe.....	29	18	0	0	15	36	3	27
Deaths.....	11	7.2	0	0	7	17	1	9

chain lies behind the sternocleidomastoid muscle and drains the nose and nasopharynx through the retropharyngeal glands. The minus sign indicates that no glands were palpable. The plus sign indicates small glands which are just palpable and are the size of a pea. Two plus signs indicate that the glands are larger but discreet up to the size of a lima bean, while three plus signs indicate larger confluent and inflamed masses of glands. No observation indicates no record. A minus sign under difference indicates that approximately the conditions on the two sides of the throat were the same.

The character of the case is indicated as mild, moderate or severe. Mild cases are those in which the admission temperature did not exceed 102 F. and in which there were no severe complications. Moderate cases are those which followed a classical course without severe complications, the temperature returning to normal from 103 or 104 F on the third or fourth day after admission.

The notations under complications explain themselves. In cases marked "R" the patient left the hospital about thirty days or more after the onset of the disease, or later, if there had been complications.

No attempt was made to study the bacteriology of the throat and this communication concerns itself with an attempt to value the importance of tonsil anatomy on the prognosis of scarlet fever.

When the cases are classified according to their severity, and all the cases are compared with the group that had had successful tonsillectomies prior to the onset of the scarlet fever and with the group in which adenitis was a clinical feature, and, again with the group in which the rashes were very severe, it seems fair to infer that the

TABLE 3.—GROUPING OF CASES ACCORDING TO EXTENT OF ENLARGEMENT OF LYMPH NODES

	Tonsillar Lymph Nodes +++ and ++ 46 Cases		+ Nodes 70 Cases		— Nodes 11 Cases	
	No.	%	No.	%	No.	%
Rash:						
++++.....	2	4	..	..	1	9
+++.....	2	4	4	6	1	9
++.....	30	66	51	73	6	55
+.....	11	24	11	16	3	27
—.....	..	..	3	4	..	..
Observations.....	45	..	69	..	11	..
Tonsil Size:						
Large.....	30	66	39	55	3	27
Moderate.....	3	7	7	10	2	17
Small.....	12	26	15	23	3	27
Remnant.....	..	..	9	12	..	..
0.....	..	..	..	..	3	27
Observations.....	45	..	70	..	11	..
Adherent:						
+.....	31	76	52	82	0	0
—.....	10	24	11	18	6	100
Observations.....	41	..	63	..	6	..
Compression:						
+.....	22	71	33	66	0	0
—.....	9	29	17	34	7	100
Observations.....	31	..	50	..	7	..
Character:						
Severe.....	13	28	11	16	1	9
Moderate.....	22	48	29	43	4	33
Mild.....	11	23	28	41	6	54
Observations.....	46	..	68	..	11	..

previously tonsillectomized cases are most favorable. There are only mild and moderate cases among them. The occurrence of a clinical adenitis doubled the percentage of severe cases and more than doubled the percentage of deaths. A severe rash had very little effect in increasing either the severity or the number of deaths.

In Table 3 the cases are grouped according to the extent of the enlargement of the lymph nodes, and I have studied the relationship to the tonsils, the extent of rash, the size of the tonsil, tonsil adhesion and compression, and finally, in accordance with the severity of the disease. Is it not a fair conclusion that the intensity of the rash and the

tonsil size bear but slight relation to the size of the nodes, as the percentages are about the same in all groups, but that when there are no nodes, there has been less adhesion and compression of tonsils and also that there are more moderate and mild cases when the lymph nodes on admission are small or absent. Probably this occurs because there is less lymphadenitis.

TABLE 4.—ANALYSIS OF UNCOMPLICATED AND COMPLICATED CASES

	Uncomplicated (61)		Complicated (91)		Adenitis (41)	
	No.	%	No.	%	No.	%
Tonsils:						
Large.....	32	52	12	47	28	73
Moderate.....	9	11	5	20	3	7
Small.....	13	21	8	30	7	18
None.....	7	10	1	3	0	0
Adherent:						
+.....	27	57	9	47	22	71
-.....	20	43	10	52	9	29
Buried:						
+.....	12	..	14	87	21	96
-.....	..	..	2	12	1	4
With Plica:						
+.....	13	..	11	..	10	..
Compression:						
+.....	16	45	13	62	21	100
-.....	19	55	8	38	0	0
Nodes:						
+.....	41	90	15	83	34	100
-.....	5	10	8	17	0	0
Character:						
Severe.....	4	6	12	43	13	35
Moderate.....	24	40	10	35	21	55
Mild.....	33	54	6	..	4	10
Deaths.....	0	..	11	..	10	..

In Table 4 I have grouped the cases as uncomplicated, complicated, and those suffering from adenitis, and I have considered the size of the tonsil, the presence of adhesions, whether or not they were buried and if so, whether they were covered by plica, or were compressed, the presence of nodes on admission, and the severity of the case. At a glance it is seen that the cases suffering from adenitis are less favorable, and that tonsillar lymphadenitis is associated with an increased severity

TABLE 5

22 asymmetrical cases.....	6	Adenitis on more covered side or on side with remnant
16 previously tonsillectomized cases.....	0	Adenitis

of the illness and increased mortality. There are fewer mild cases. I have emphasized in all these tables the importance of compression and covering of the tonsils because it seems to me that the organisms or toxins are forced by actual pressure into the lymph stream from the swollen tonsils. This is just as harmful as rhythmic pressure is known to be, on a phlegmon elsewhere.

Table 5 is an analysis of the asymmetrical cases and the previously tonsillectomized cases. These show no adenitis where there are no

tonsils and homolateral adenitis on the worse side in the presence of asymmetrical involvement.

That the anatomy of the tonsil is not the sole element in determining the character of the body's reaction to the virus is obvious, but its importance seems equally obvious. This conclusion is strengthened more by the observation of individual cases than by the statistics. On a number of occasions I have been able by pressure or manipulation to empty the infrapical pocket or a crypt of the tonsil, and have been gratified to see the swelling of the nodes recede and the temperature rapidly fall. A tonsillectomy is an important prophylactic measure against some of the so-called complications of scarlet fever, especially those arising in the throat.

Table 6 shows the conditions which have complicated our cases. I have arranged them roughly into two groups: the septic invasions which are consequent on the conditions in the nose and throat, and those other conditions which are more or less unrelated to the scarlet fever, such as vaccination, herniotomy or diphtheria. This rough grouping seems to show that the majority of the complications follow, or are associated with, a primary tonsillar infection and a subsequent cervical lymphadenitis. The benign character of most of the previously tonsillectomized cases, and the homolateral involvement of those cases with remnants of tonsil or unilaterally compressed tonsils tend to show, what many of us already accept, that the complications are really due to a secondary invasion during scarlet fever, of the tissues from a primary focus which is frequently in the tonsils. Further proof is the obvious discoverable source of infection in cases in which the tonsils were not implicated (as in the case with arthritis consequent on bad teeth, or a case not included in these statistics, where a fatal gonococcus peritonitis developed abruptly on the fifth day, from a focus lurking in the tubes).

The cervical lymphadenitis which forms such an important part in the description of scarlet fever seems from my cases to occur only when the tonsils are infected, and to be aggravated when they are swollen and pressed on while swallowing so as to express the toxins into the lymph stream. It does not occur in clean previously tonsillectomized cases and is worse on the more badly affected side in patients having tonsils.

Is it not much more rational to regard the cervical lymphadenitis as a response to drained toxins and if it is such a response why not regard the offending phlegmon in the throat as we do other phlegmons and treat it on the same principles? Elsewhere in the body the palpable lymph nodes seem to be enlarged in proportion to the amount of eruption.

TABLE 6.—ANALYSIS OF CASES, WITH COMPLICATIONS AND RESULTS

	Ton- sils Dis- eased	Ton- sils Not Dis- eased	Tonsil Size		Adherent		Buried		Cov- ered with Plica	Compressed		Anterior Nodes Large on Admission		Severe	Mod- erate	Mild	Total Cases
			Large	Small	+	-	+	-		+	-	+	-				
Septic Invasion from Focus																	
Continued temperature.....	8	3	6	3	4	2	5	..	4	4	1	4	1	3	6	2	11
Tonsillitis.....	2	..	0	2	1	1	1	..	1	1	..	2	..	..	2	..	2
Peritonsillar abscess.....	4	..	3	..	3	1	1	..	2	3	..	4	..	..	..	..	4
Adentis.....	41	1	28	7	29	9	21	..	10	21	..	34	..	13	21	4	34
Nasal discharge (profuse)...	6	..	5	1	5	2	4	..	2	1	1	6	..	6	..	1	7
Ethmoiditis.....	1	..	1	..	..	..	..	..	..	..	..	..	..	1	..	..	1
Otitis media, purulent.....	12	..	9	3	..	4	8	..	4	9	..	12	..	1	5	..	12
Mastoiditis.....	2	..	2	..	..	..	2	..	2	1	..	2	..	2	..	..	2
Arthritis.....	4	1	2	2	1	1	4	..	1	3	..	4	..	1	3	..	4
Cardiac involvement.....	8	3	6	1	5	1	5	..	2	4	1	6	..	2	4	2	8
Herpes (lateral labial).....	1	..	1	1	..	1	1	..	1	1	..	2	..	1	..	..	1
Meningitis.....	1	..	1	..	1	..	9	1	..	1	..	1	..	1	..	..	1
Nephritis.....	2	1	2	1	1	..	2	..	..	1	..	2	..	2	1	..	3
Bronchitis.....	1	..	1	..	..	..	1	..	..	2	..	1	..	1	..	..	1
Pneumonia.....	5	..	4	1	5	..	3	..	2	2	..	5	..	4	..	..	4
Toxic ezema.....	1	..	..	1	..	1	..	..	..	..	..	1	..	..	1	..	1
Coincident Unrelated Infections																	
Diphtheria.....	10	1	9	..	5	1	5	..	3	5	..	9	..	4	3	3	10
Measles.....	1	..	..	1	..	..	1	..	1	1	..	1	..	1	..	1	1
Chicken pox.....	5	1	4	1	3	1	4	..	1	2	..	5	..	1	3	1	5
Foot.....	1	1	1	..	1	1	1	..	1	1	..	1	..	1	1	..	1
Hand.....	1	1	1	..	1	1	1	..	1	1	..	1	..	1	1	..	1
Surgical Infection	1	1	1	..	1	1	1	..	1	1	..	1	..	1	1	..	1
Hernia.....	1	1	1	..	1	1	1	..	1	1	..	1	..	1	1	..	1
Empyema.....	1	1	1	..	1	1	1	..	1	1	..	1	..	1	1	..	1
Vaccinia severe.....	2	1	2	1	1	2	1	..	..	1	..	3	..	..	1	2	3

Why should the lymphadenitis be regarded as an integral part of scarlet fever rather than as the result of infection or inflammation in the drained area? If this view is correct, there should be more painstaking observation of the throat in scarlet fever.

I now come to a part of my study which I approach with considerable diffidence because of the fewness of the cases with which I have to deal, namely, the cases in which surgical measures were employed. Nevertheless, the narration of the individual cases gives me an opportunity to stress the importance of the anatomy of the tonsils in connection with the invasion of the body by pus organisms or their toxins during scarlet fever.

REPORT OF CASES

CASE 1.—G. Z., nurse, whose tonsillar glands were not enlarged on admission but whose small tonsils were almost covered by plica. Her temperature was rising, her nodes were enlarging and on the second day she suffered from considerable pain in the neck and throat.

Under procain anesthesia, a small horizontal incision was made in the plica which released the pressure on the tonsils. In twenty-four hours her temperature had fallen to normal, her lymph node enlargement had subsided and her case remained a mild one.

CASE 2.—A. H.; the tonsils were buried, covered with plica, adherent and with large glands. This child had a similar operation but due to the manipulation, the temperature rose for a day, the nodes, however, speedily subsided, and the patient made an uneventful convalescence.

CASE 3.—D. R. on admission had tonsils completely covered with plica, with large anterior nodes. She had a persistently high temperature, with large nodes. On the fifth day the plica was incised, and the temperature fell from 105 to 103 F. and remained at that point for three days. The general condition of the patient improved. Permission to perform a tonsillectomy was refused. The tonsils sloughed out from their beds and the patient died on the twentieth day of her disease.

Another case which enforces the importance of the anatomic structure of the tonsils was one of scarlet fever which may have been contracted in the hospital and of which we have a careful observation preceding the onset of the disease. This patient entered with no rash and no desquamation after an illness of five days. The tongue was clean and red, with prominent papillae. The throat was congested, the tonsils were adherent, especially the right. There was a mild adenitis, more marked on the right than on the left. On the fifth day her temperature went up suddenly to 105 F. Her nodes became very much more swollen and her condition serious. Operative intervention for her adherent covered tonsils was refused by her father. She died on the fifteenth day of her illness, twenty days after admission.

Five cases in my series were tonsillectomized.

CASE 4.—A. G. had tonsils compressed on swallowing; they were not everted; they were buried and adherent; there were large lymph nodes. She

had a left otitis media purulenta and a facial paralysis on admission. Her mastoid was tender, there was a profuse mucopurulent discharge from her ears. Her temperature ranged up to 103.8 F., with enlarging nodes the second week of admission. She was too ill for a mastoid operation. She had been ill fourteen days, and on the twenty-seventh day of her illness, the thirteenth day after admission, her tonsils were enucleated under ether. Three days later her temperature fell to 101 F. and continued to fall; the swelling of the nodes subsided; her mastoid was then opened up and after a subsequent attack of chickenpox and diphtheria, she was discharged, after having been in the hospital eleven weeks and two days.

This patient was desperately ill and was one of five similar cases in the hospital at the time, little children with buried tonsils, enlarged lymph nodes and very marked toxemia. She was the only one who was tonsillectomized, and the only one who recovered. The operation was offered to the parents of two of the others and refused.

CASE 5.—L. W. entered as a mild case; both tonsils were covered with plica. She suffered considerable pain from the swelling of her tonsils and seven days later her temperature had risen to 103 F. and her pulse to 120. Her lymph nodes were enlarging, and there was considerable peritonsillar infiltration and the question of peritonsillar abscess was discussed. She had seen the remarkable results in the preceding case and requested tonsillectomy, which was done by Dr. Crawford, under local anesthesia. Her temperature was lower the next day and soon fell to normal.

CASE 6.—M. H. was admitted March 22 with tonsils buried, adherent and compressed on swallowing. There were large lymph nodes. She was a mild case until April 2 when she had a rising temperature with a marked cervical adenitis. Her nodes continued large until May 17 when tonsillectomy and adenoidectomy were performed. This was followed by rise of temperature and increase in size of the lymph nodes the following day. These symptoms subsided on the next day. The nodes continued to subside and the inflammation remained in one node which broke down and was incised, after which the patient recovered.

CASE 7.—D. Mc. also had large buried tonsils, a brawny infiltrated cervical adenitis, and a migrating erysipelas. The tonsils were excised; there was a prompt subsidence of the lymphadenitis. This patient recovered.

CASE 8.—The case of L. J. is instructive from many standpoints. She was admitted with an intense erythematous rash and a red throat. Her tonsils were so large on admission that they were everted and not compressed. Her lymph nodes were large and tender. April 15, six days after admission, and on the eighth day of her illness, her temperature had subsided to 101 F.; her tonsils had shrunk so as to be covered by the anterior pillar. The temperature now rose to 101.6 and 102.2 F. on subsequent days and her lymph nodes became enlarged, tender and infiltrated. Her tonsils and adenoids were excised under local anesthesia. In five days her temperature was normal and continued normal for ten days. Suddenly she developed a severe nephritis and convulsions, and finally consolidation at her left base.

This case is especially interesting because her twin sister as well as another sister were in the hospital at the same time and all suffered from nephritis as a complication and had prolonged severe illnesses. This may have been due to a similar invading organism, or a similarity in biologic reaction on the part of the body.

CONCLUSION

Firstly, my statistics and the cases narrated lend support to the view that the inflamed tonsil is a focus of infection and that the cervical lymph nodes enlarge from it in scarlet fever just as they might enlarge in the absence of scarlet fever. The inflamed tonsil becomes a phlegmon on the wall of the pharynx.

Secondly, rhythmic swallowing movements when they compress the tonsils force toxins or organisms into the lymph stream with subsequent inflammatory reaction in the adjacent lymph nodes.

Thirdly, prophylactic removal of the tonsil when buried or covered with plica or incision of the plica so as to uncover the tonsil prevents some of the severe complications arising from this source.

Fourthly, painstaking observation of the tonsil during scarlet fever is helpful, and leads to the view that the infection is conditioned by the anatomical relations.

Fifthly, in certain selected cases tonsillectomy may be performed with benefit during scarlet fever.