

men can be allowed to act on their own responsibility.

WHOOPIING COUGH.

Incubation.—During this period no symptoms of the disease present themselves. Statistics are at variance regarding its length, and the fact that the incubation takes place so insidiously makes the determination of the exact duration of the incubation difficult in most cases. It probably lasts from two to seven days, with an average of three to four days.²⁴

Eustace Smith²⁵ says it probably varies in different individuals. In one very clear case, noted by Dr. Bristowe, the period was exactly a fortnight, but according to some writers it may be as short as four days. The infectiousness begins with the earliest symptoms. Indeed, it is in the early non-spasmodic stage that the child is most likely to be a source of danger to others; for, when the whoop appears, his power of communicating the disease begins to decline. Still, it is not at an end until a period of at least six weeks has elapsed from the beginning of the attack.

Williams²⁶ says the period of incubation is somewhat uncertain. The usual period between exposure and beginning of catarrhal symptoms is 7 to 10 days. The characteristic whoop appears seven days later, as a rule, so that the interval between exposure and whooping is usually about 14 days.

Sticker²⁷ says a period of incubation varying from two to five or eight days in length, without symptoms, precedes the actual disease.

Observation.—The "Code of Rules for the Prevention of Infectious and Contagious Diseases in Schools" recommends the period of observation to be 21 days; but probably 15 days would be sufficient if the individual were examined carefully at the expiration of that period, and found to be free from all trace of catarrh of the fauces and pharynx and of all signs of bronchitis.

The infectiousness is marked in the earlier stage, and before the characteristic whoop begins. It declines rapidly after the acute stage has passed. On the authority of Williams, Weill, who in 1894 expressed the opinion that whooping cough was contagious only during the premonitory catarrhal stage, has since²⁸ put his opinion to the test. On various occasions he permitted nearly 100 young children, who had not previously suffered from whooping cough, to be associated in the same ward for 20 days or more with children suffering from the disease during the stage of whooping. In only one case was the disease contracted, and in this instance the patient from whom the infection was derived was in the very earliest period of the whooping stage. In three small epidemics he was able to satisfy himself that infection was contracted from children

who had not yet begun to whoop. Weill concludes that infection ceases very soon after the characteristic whoop commences, and that therefore in a family it is not the patient who is already whooping, but his brothers and sisters who have not begun to whoop, that ought to be isolated.

That the disease is highly contagious at the height of its course seems certain, but that the patient is dangerous as long as he coughs, as some writers affirm, is doubtful, though for the sake of prudence it is better to assume this.²⁹ According to Rosenstein, Schönlein and others, in different epidemics the contagiousness is very different (Sticker).

Although the greatest risk of contagion is during the catarrhal stage, and although the patient at the height of the convulsive stage is seldom dangerous, it may be taken as a rule that the person is to be avoided as long as he coughs (Sticker).

Isolation.—The "Code of Rules for Prevention of Infectious and Contagious Diseases in Schools" says that the patient should be kept isolated from susceptible persons for six weeks from the commencement of the whooping, and should then be allowed to mingle with others only if the whoop and all characteristic spasmodic cough have ceased. If all cough have completely passed away earlier, which is not often the case, this rule may be relaxed and the period of isolation shortened.

(To be continued.)

GUNSHOT WOUNDS OF THE KNEE-JOINT BY THE PROJECTILE OF REDUCED CALIBRE.

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WITH the use of the old armament, wounds of the knee-joint constituted 3% of all wounds observed in military practice, and because of its exposed position and the extent of its synovial sac, it gave us 28% of all joint wounds that came under treatment in war hospitals. Gunshot wounds of this joint were then, as they may be today, divided into five classes, as follows: (1) Simple perforation of the synovial sac without accompanying lesions of any bone; (2) injury to the joint with lodged ball; (3) injury to the joint exhibiting guttering of the articular ends of the bones; (4) complete perforation of the bones traversing the joint in different directions; (5) implication of the joint by fissuring and comminution of the bones entering into its formation.

The treatment employed in the preantiseptic era was: (1) Amputation; (2) conservation; (3) excision. The first of these—amputation—was the rule, and the surgeon who failed to amputate in all gunshot wounds of the knee failed in his duty to his patient. Conservation

²⁴ Griffith: American System of Medicine, 1897, I, 715.

²⁵ Allbutt's System of Medicine, II, 239.

²⁶ Twentieth Century Practice of Medicine, XIII, 378.

²⁷ Nothnagel's Encyclopedia of Practical Medicine, W. B. Saunders & Co., 1902, p. 550.

²⁸ Lyon Medical, May 9, 1897.

²⁹ Sticker: Nothnagel's Encyclopedia of Practical Medicine, W. B. Saunders & Co., 1902, p. 550.

and excision were at times practised when patients refused amputation, but even in those cases in which the joint capsule alone was involved, the results of this plan of treatment were so disastrous that it was universally condemned.

When antisepsis came into vogue our first observations in military practice of the value of clean wound treatment, as it was then understood, was given to us by Reyher and von Bergmann in 1877 and 1878 during the Russo-Turkish War. Reyher reports eighteen primary aseptic cases of wounds of the knee, regardless of the extent of the joint involvement treated by antiseptic dressings, of whom three died, a mortality of 16.6%. The treatment was strictly conservative without excision or amputation. The cases ending in recovery are said to have had movable joints. He employed irrigation in severe cases, while the simple cases were cleansed externally and dressed with wet carbolic gauze. von Bergmann employed the same method of treatment with the following results: Out of fifteen gunshot wounds of the knee, one of which had suffered injury to the bony articulation, fourteen recovered, in two of whom amputation was required. The fatal case was one in which amputation was practised. Nothing is said of the amount of motion remaining in those who recovered. The majority of them more than likely got well, as did those of Reyher with movable joints. The cases so treated by Reyher and von Bergmann occurred before the change in the armament of the nations had taken place. They represent therefore the result of injuries by the old soft leaden bullet of 45 calibre, weighing approximately 480 gr., treated conservatively under antiseptic methods. Grouped together we find that the mortality was for the two sets of cases only 11.1%. Compared to the results of treatment of gunshot injuries by the old arm in the preantiseptic era the results of Reyher and von Bergmann were certainly a revelation. In looking over the statistics given us by Otis, we find that gunshot wounds of the knee in the Civil War under all methods of treatment then in vogue gave a mortality of 53.7%, which, compared to the results of Reyher and von Bergmann, places to the credit of antisepsis a total of 41.6 lives saved in every 100 men hit in the knee.

In late years changes have come about in the manufacture and composition of rifle bullets to enhance the satisfactory results already alluded to both as to life and limb. The character of gunshot wounds of bones especially is very much influenced by the density of the metals which inflict them. Longmore, among the older writers, ventured to explain thirty-five years ago what would be the special features of gunshot wounds as soon as it became practicable to use steel bullets. The evolution of the military rifle and the missile it propels today have given us a factor which in a humane sense stands next in importance to antisepsis.

For military and ballistic reasons which do not concern us in this instance, dating from 1886 to 1893, all the governments changed their armament

from rifles of larger calibre and lower velocities propelling leaden bullets easily deformed upon impact with resistant bone, for those of smaller calibre and higher velocities propelling steel-clad bullets that very seldom deform against the most resistant tissues. Following the example of the other governments, the United States adopted the Krag-Jorgensen rifle as its military hand weapon in 1893. Before doing so, however, the War Department caused to be instituted certain experiments with the bullet of the proposed weapon which I had the pleasure of conducting at Frankford Arsenal in 1892. The experiments consisted in firing into ten cadavers with simulated velocities for all the ranges from 100 up to 2,000 yards.

The results of these experiments and those of military surgeons in Germany and France engaged in similar work demonstrated marked differences between the destructive effects of the old and new arm, and these differences were specially noted after firing into tissues of varying resistance. As a broad principle it may be stated that the amount of destruction was invariably proportional to (1) the velocity, (2) the sectional area of the projectile, and (3) to the resistance which the ball encountered on impact.

In the soft parts, like the skin, muscle and lung, tissues offering a minimum amount of resistance, the area of destruction was limited to the channel wound, which as a rule only equaled the sectional area of the bullet. The more resistant tissues, like the diaphyses of the long bones and those anatomical parts containing a great deal of water, or soft parts enclosed in rigid walls, showed destructive effects which were proportional to the velocity and sectional area of the bullet. For instance, close shots with the two bullets were alike severe in the shafts of the long bones, the intestines loaded with fluid contents, the heart, head, etc. In the mid and remote ranges where we commence to see a marked falling off in the velocity of the two bullets, the amount of destruction accomplished by the reduced-calibre bullets was always less than that inflicted by the bullet of the old arm, due doubtless to the smaller frontage of the former.

The epiphyseal ends of the bones, compared to the compact substance, showed destructive effects in proportion to the sectional area of the projectile. In the close ranges the old leaden bullet showed marked destruction, not only because it was primarily greater in sectional area, but because its diameter was usually made greater still by deformation. On the other hand, the smaller calibre bullet showed a marked tendency to make clean-cut perforations in the spongy ends of the bones, due doubtless to its sectional area, which was primarily less, and which was never increased by deformation.

The humane features of the new bullet having been so thoroughly established upon the articulation by experimentation, the results of the actual conditions in war were naturally awaited with

the greatest interest concerning these results upon the knee.

Makin, in his "Surgical Experiences in South Africa," referring to joint wounds, states that, in spite of the fact that the knee was the most frequently wounded among the articulations, such injuries gave less anxiety and attained a more favorable result than is the case in civil practice. Limitation of movement was slight or absent in most cases, and he remembers of only one case—a man shot at 300 yards—in which serious ankylosis resulted. He never saw a case of lodged Mauser or Lee-Netford ball in a joint, a condition that bears so significantly on prognosis.

The staff of a Civilian War Hospital report that joint wounds gave no serious complications. The wounds healed without difficulty and gave rise to but little synovial effusion. In eight cases of wounds of the knee in which perforation of the patella occurred a perfectly movable joint resulted, although in some there were complications from wounded vessels and nerves.

Sixty-two cases of gunshot injury were reported to the Surgeon-General's office since July, 1898, from various missiles, as follows: Thirty-calibre Mauser, 17; 45-calibre brass-jacketed Remington, 8; 30-calibre Krag-Jorgensen, 2; character of missiles not stated, 27; revolver bullet, calibre not stated, 3; small shot, 1; shrapnel, 3; shell fragment, 1.

We find that five died, making a mortality of 8%. Two of the deaths resulted after amputation. Of the 57 who recovered 45.6 were restored to duty. If we compare these 62 cases with the group of 33 cases given us by Reyher and von Bergmann, we find that our mortality was only 3% less than theirs. This is doubtless due in part to the large number of cases by the reduced-calibre weapon in our group of 62 cases. We may admit, for the sake of comparison, that gunshot wounds of the knee under our present system of wound treatment in war gives us a mortality of 8 to 11% irrespective of the character of the missiles concerned in the production of the injury, and, further, that 45.6% of those who recovered are fit for duty.

In order to study the full benefit likely to arise from the use of antiseptics and the reduced-calibre bullet, a study of the results of wounds from the latter alone should be made. Of 19 cases occurring in the Santiago campaign we find that none died, that 14 were restored to duty, and five were discharged on surgeons' certificate of disability, or otherwise disposed of.

The following table shows at a glance the successive results of gunshot wounds of the knee from the days of the Civil War to the present time.

GUNSHOT WOUNDS OF KNEE-JOINT.

CIVIL WAR. 1861-1865.				
LARGE CALIBRE, ANTISEPTIS.				
Mortality	:	:	53.7%	
Recovery	:	:	46.3%	
Total, 100.0%			Fit for duty	: : 00.0%
			Unfit for duty	: : 100.0%

33 cases by Reyher and von Bergmann.

RUSSO-TURKISH WAR. 1877-1878.				
LARGE CALIBRE, ANTISEPTIS.				
Mortality	:	:	11.1%	
Recovery	:	:	88.9%	
Total, 100.0%			Fit for duty	: : —
			Unfit for duty	: : —

62 cases.

REPORT SURGEON-GENERAL'S OFFICE SINCE 1898.				
VARIOUS CALIBRES, ANTISEPTIS.				
Mortality	:	:	8.0%	
Recovery	:	:	92.0%	
Total, 100.0%			Fit for duty	: : 45.0%
			Unfit for duty	: : 54.4%
			Total, 100.0%	

19 cases.

SANTIAGO CAMPAIGN. 1898.				
REDUCED CALIBRE, ANTISEPTIS.				
Mortality	:	:	00.0%	
Recovery	:	:	100.0%	
Total, 100.0%			Fit for duty	: : 73.6%
			Unfit for duty	: : 26.4%
			Total, 100.0%	

To recapitulate them: (1) We find that the mortality of gunshot injury of the knee-joint in the Civil War was 53.7%, and as amputation was universally done all those who recovered escaped with the loss of a limb, unfit for duty; (2) that 33 cases of gunshot wounds of the knee produced by the larger calibre lead bullet in campaign, reported by Reyher and von Bergmann, treated antiseptically, gave a mortality of 11.1%; (3) that 62 cases produced by a variety of missiles reported by the Surgeon-General since 1898, similarly treated, gave a mortality of 8%, and that 45.6% of those who recovered were restored to duty; (4) that of 19 cases in the Santiago campaign by the reduced-calibre bullet the mortality was nil, and that 73.6% of the wounded recovered fit for duty. It is thus seen that the humane features of the reduced-calibre bullet have operated not only in diminishing the mortality in gunshot injuries of the knee from about 8 or 11% to nil, but that it has increased restorations to duty 28%, as shown by comparing the last two tables.

The foregoing figures relating to the humane features of the reduced-calibre bullet established fully the predictions of von Coler, who said at the conclusion of his experiments with the German Mauser that if it be found that wounds by the small bore are aseptic, joint wounds will be the most favorable of all bone injuries to treat.

NOTES IN CUBA.¹

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LAST February I attended a meeting of the Pan-American Medical Congress at Havana. The congress itself was rather disappointing. It was a young organization, and the papers were apt to be of the didactic class, or perhaps had previously been read before other societies. Some very good

¹ Read before the Cambridge Medical Improvement Society Feb. 24, 1902.