

arteries especially are tortuous and serpentine, and sometimes the ophthalmoscope reveals thickening of the arteries at the fundus oculi. Changes in the coats of the arteries are observed in cases of Bright's disease, in the rheumatic and gouty, in the syphilitic, and sometimes in athletes as the result of overstrain, and in lead-poisoning and scurvy. Excessive use of tobacco and alcohol occasion these changes. Certain infectious diseases besides syphilis seem also to excite pathological alterations in the walls of the vessels, as, for example, diphtheria and typhus fever. Exposure to cold and heat, want of food, or good air, also, may produce these changes; and, lastly, they may appear as among the earliest of the degenerations incident to senility.

It is important to appreciate the abnormal conditions of the walls of the artery in the following: in the diagnosis and prognosis of cerebral hemorrhage and thrombosis; in the prognosis, diagnosis, and treatment of changes in the aortic valves of the heart; and in the prognosis and just estimation of many diseases when found associated with this sign of beginning degeneration, and which may be the only positive sign of beginning decay.

I have already alluded to the fact that in pulse of high tension the vessel may be felt in the interval of pulsation, and one may be so deceived as to mistake such a condition of things for a vessel with diseased walls, whereas the artery is over-distended with blood and the walls may be normal. This is not so infrequently met with, and very often we find that disease of the walls eventually does supervene, apparently by reason of this condition of high tension. It may be necessary sometimes to differentiate these conditions, and Dr. Broadbent, in his interesting and valuable lectures on the pulse in the *Lancet*, 1875, to which I shall often refer, has demonstrated how perfectly this can be done by having the patient inhale some nitrite of amyl. If the pulse be one of high tension only, the thick, cord-like vessel disappears in the interval of pulsation, and is only felt during pulsation, and is then very soft. If the walls of the artery are actually thickened or diseased, very little change takes place. But, as I have said, you may find both combined, and the difference is in the change in the compressibility of the pulse.

2d.—Phenomena referable to various factors of the pulse.

The Heart:—Increased and diminished frequency of the pulse.

a. Increased frequency.

I ask your attention to the following schemes of the causes of increased frequency of the heart as determined by experiment on animals. It is taken from Lauder Brunton's book on the "Experimental Investigation of the Action of Medicines," Part I., Circulation, London, 1875. I do this so that you may, if possible, explain to yourselves the probable cause of a frequent pulse in many conditions. I should be overstepping my limits of time were I to attempt it.

Paralysis of vagus roots or vagus fibres.

ends in the heart.

Stimulation of the } Directly.

sympathetic roots } Indirectly by lowered blood-pressure.

Stimulation of the } Directly.

cardiac ganglia. } Indirectly by increased temperature of the body.

A pulse of 90 or more may be regarded as a pulse of abnormal frequency in an adult. There are exceptions to this, but they are rare.

In the following pathological conditions a frequent pulse is of importance in diagnosis or prognosis.

1. Fevers.—"In fevers the pulse is generally quickened in proportion to the elevation of temperature, though the proportion between the pulse and the temperature varies in different fevers. In scarlet fever the pulse is quicker than in typhoid fever with the same temperature, hence a quick pulse is of less serious import in scarlet than in typhoid fever. The same elevation of temperature quickens the pulse relatively much more in children than in adults."

"If a pulse is quicker than the temperature will explain, it indicates cardiac weakness—the weakness being proportionate to the want of ratio between the temperature and the pulse. In this way the pulse affords important information in prognosis and treatment."

"A pulse that day by day progressively increases in frequency, the temperature remaining the same, shows increasing cardiac weakness."

"In all febrile diseases a pulse in adults over 120 is serious and indicates cardiac weakness. A pulse of 130 or 140 indicates great danger, and with a pulse at 160 the patient almost always dies."\*

a. In eruptive fevers, just before the appearance of the eruption, the pulse becomes sometimes very frequent.

b. In relapsing fever, during the febrile periods, the pulse is of very great frequency, and is often 130 to 140. It attains a greater degree of frequency than in any other fever, without being of grave significance (Murchison). †

c. In typhoid fever the prognosis is usually bad when pulse persistently exceeds 120 (Murchison). †

d. In the convalescence from all fevers the range of increase in the frequency of the pulse in changing from a recumbent to a sitting or standing position, or the range of decrease in its rate in changing from a standing or sitting to a recumbent position, is a measure of the debility of the patient. During the pyretic period such changes in position have little or no effect. The rate of the pulse may therefore be of importance in gauging the strength of the patient.

2. Inflammations:

a. The occurrence of a sustained frequency of the pulse after confinement is a very suspicious symptom, and may betoken advent of puerperal peritonitis.\*

\* A Hand-book of Therapeutics, by Sidney Ringer, M.D. William Wood & Co., New York, 1879, pp. 7 and 8.

† A Treatise on Continued Fevers, by Charles Murchison, M.D.; London, 1873.

\* Pulse in Forming Stage of Puerperal Peritonitis. Archives of Practical Medicine, No. 3, Mary Putnam-Jacobi, M.D. New York, 1873.