Experiment 3. A full-grown cat was drowned for five minutes, and opened as soon as possible—viz., about the end of the seventh minute.

Observation.—Both auricles and both ventricles were acting feebly. There were two auricular contractions to one ventricular; the ventricular contraction immediately followed the second auricular. This continued for a short time, but at the twelfth minute there was but one auricular contraction to each ventricular action; in fact, the heart was acting feebly, but regularly, and in perfect rhythm. This lasted up to the fifteenth minute.

These experiments tend to show the duration of the rhythmical action of the heart in some cases. In the cat, it is true that when observed at the end of the seventh minute the rhythm was slightly disturbed, but it was subsequently restored, and it is therefore fair to assume that it might also have been restored, and the circulation re-established, if artificial respiration had been resorted to.

With regard to the second point, the experiments above detailed, and those to which I have referred in my communication to the Royal Medical and Chirurgical Society, are sufficient to show that the *ventricular* portion of the heart often contracts for a considerable time in asphyxia. I have frequently seen very strong ventricular contractions in rabbits up to the twelfth, fifteenth, and twentieth minute.

It may be thought that the influence of the air on the surface of the heart may in some cases have tended to prolong its action. As my observations were made without the pericardium being disturbed, it is doubtful whether this could have had any such effect. But further, I have seen the ventricles in action when the chest was not opened until the periods I have mentioned.

With regard to the third point, I believe it will be found that the following is generally the order in which the different cavities cease to act; but as my observations on this point have not been very numerous, I do not insist on my conclusions. The left auricle usually ceases to act first; the right auricle and the two ventricles continuing to contract. Then the left ventricle ceases; subsequently the right ventricle is arrested, and lastly the right auricle, which often goes on contracting for a long time.

The great practical point in connexion with this subject, as far as the treatment of asphyxia is concerned, is—*Whether artificial respiration is capable of restoring the circulation:*

1st. When the action of both ventricles of the heart has ceased.

2ndly. When the right cavities alone are acting.

3rdly. When the left auricle has ceased to act, but the other cavities are contracting.

4thly. When the whole heart is acting rhythmically, but feebly.

1st. We have no proof that artificial respiration or any other means is capable of restoring the circulation when once the action of the ventricles has entirely ceased. Mr. Erichsen and Dr. Sharpey performed many experiments with the view of ascertaining this point, and the results always were, that although they could re-excite the circulation through the lungs, and sometimes reproduce the action of both auricles, yet they could never succeed in re-exciting the ventricles. "But, on the other hand, there is never any difficulty in re-exciting the action of this organ (the heart) if regular contractions of the ventricles are still continuing, however feebly or slowly." *

2ndly. I am not aware that we have any proof that, when the right cavities of the heart alone are acting, the circulation can be restored by artificial respiration. My own belief is that such a result cannot be brought about.

3rdly. Can artificial respiration restore the circulation, supposing the left auricle alone to have ceased acting? The question almost resolves itself into this: Can we re-excite the action of the left auricle when it has once ceased? Mr. Erichsen's and Dr. Sharpey's experiments distinctly prove that this can be effected. One of the experiments I have above detailed also shows this, for the abstraction of blood was followed by reaction of the left auricle. My belief is, that as long as the ventricles are acting in concert, and in rhythm with either one auricle or both, it is quite possible that a persistent use in artificial respiration may reanimate an asphyxiated animal; of course, the longer the use of such means is delayed the smaller will be the probabilities of success.

4thly. If it be possible to re-excite the circulation, even when the left auricle has ceased, *à fortiori* may we assume this may be accomplished as long as the regular rhythm of the heart is in nowise disturbed, except as regards its frequency and power. It is during the continuance of this rhythmical action that efforts to reanimate are most likely to be successful; every moment of delay adds to the difficulty and increases the danger.

In a letter which has been addressed by Sir B. C. Brodie to the Royal Medical and Chirurgical Society referring to my paper on Asphyxia, that distinguished physiologist and surgeon states that he has never seen the rhythmical contractions of the heart continue after four minutes and a half of complete submersion. It is very possible that differences may exist in different species of warm-blooded animals as to the time rhythmical actions last, as well as in the individuals of each species. My observations have been chiefly made on rabbits, but they have extended also to dogs and cats. I have found that the duration of the heart's contraction in asphyxia was longer in the first-mentioned animals than in the two latter.

It has been the opinion of many physiologists, that, in cases where animation has been restored in man after prolonged submersion, syncope has taken place at the period of immersion. To this point I have briefly alluded in my paper already referred to. That syncope occasionally takes place in drowning is highly probable; but of the fact itself it is obvious we can have no proof. It appears to me, however, that it is unnecessary to resort to this supposition to explain the recoveries which have taken place. From our knowledge of the prolonged action of the heart in the lower animals, and from facts we are acquainted with in regard to man, I am induced to believe that, as a rule, there is in the latter a feeble action of the heart continued in asphyxia for several minutes—an action which may be increased, provided the function of the lungs can be restored.

In considering the question of the duration of the heart's beat in asphyxia, and the possibility of restoring animation in the affection, it is very desirable that, if we err, we should err on the right side. It is better that we should make *fifty* ineffectual attempts to save life, acting on the supposition of the prolonged duration of the heart's beat, than that we should suffer *one* life to be lost by allowing the opposite assumption to paralyse our efforts. That animation can be restored by artificial respiration, when normal respiration has ceased, is incontestable, and the exact time beyond which no efforts can be of any avail is by no means settled.

Liverpool, July, 1861.

* Mr. Erichsen on Asphyxia. "Edinburgh Medical and Surgical Journal," vol. lxiii.

ON THE RADICAL CURE OF VARICOCELE.

BY J. REDFERN DAVIES, ESQ., M.R.C.S.,
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IN THE LANCET of the 22nd ult., p. 610, is a very interesting case of varicocele, treated by Mr. Henry Lee. Thinking that the following one may be of interest to the profession, I forward it for publication:—

The patient, aged seventeen years, was admitted into the infirmary on the 10th of December, 1858. He was the subject of varicocele on the left side, which has existed for the last three years, and to so great an extent as to prevent him from following his employment. Being desirous of radically curing him, I adopted the method of M. Ricord, which I had seen him perform with success; but instead of the hempen ligature which he used, I tried to do the same thing with silver wire—namely, between the vas differens and the veins, I passed, by means of a needle, a double silver wire, and by the same apertures in the opposite direction, behind all the veins, another wire. By engaging one free end of the wire through the loop of the other one, and doing the same on both sides, the veins were by traction on the wire compressed. This traction was kept up constantly by means of an elastic watch-spring, bent in the shape of a horse-shoe.

In ten days' time, thinking the varicocele cured, and wishing to remove the wires, I tried to do so, and found I could not, though it was easy enough with hempen ligatures. I therefore cut off the wires as short as I could, trusting to the innocuity of silver wires to cause no harm. In another week the punctures were well healed, and he was discharged, the varicocele then appearing perfectly cured.

Seeing him again in about a year's time, upon examination I found that all things remained as when he left; and he stated that he had resumed his work immediately upon leaving. He himself was totally unaware of there being any wires in his scrotum.

Birmingham, July, 1861.