Dissertation
On the Evidence of live birth in questions of Infanticide.

by

Robert Moor
The subject of the present dissertation is one which must claim the earnest study of the medical juris. The question of live birth in cases of Infanticide is necessarily of the first importance and the settlement of it involves many points of considerable difficulty. It must first be distinctly shown that the child has been born alive before any judgment can be required in the face of the nature of the
criminal interference. The various methods, or tests, as they are called, which have been proposed and adopted for the decision of the question are, it must be confessed, open to fallacy, and serious objections have consequently been urged against the value of the most important of them. None of these tests, when taken singly, can be said to furnish demonstrative evidence of line birth, it is only when their results are combined that reliance can be satisfactorily placed in them. In the following essay it is proposed to discuss the nature and the value of the different tests, their fallacies, and the objections taken to them.
The physical changes, consequent upon respiration, which take place in the lungs are the chief source whence evidence is to be obtained of live birth. If respiration can be clearly shown to have been established then almost conclusive evidence has been advanced in favour of it. The question of live birth is, in short, rest, mainly upon the question, Has the child respired? And the case must be exceedingly rare where it can be required of the medical juris to prove that live birth had taken place prior to respiration. The changes which take place in the lungs after respiration can be important as evidence only when there are contrasted with the
condition of the same organs as they exist in the foetus. The foetal characteristics of these organs are consequently very important. They present an appearance, in the foetus, very similar to those of the adult liver, their consistence firm and fleshy, and colour reddish brown; the cavity of the thorax is not entirely occupied by them, but they lie in its posterior part leaving the pericardium usually uncovered and when cut into they do not exsanguinate, and are specifically heavier than water. After respiration they have a pale red color, a soft spongy texture and exsanguitate when incision, the thoracic cavity is completely filled by them and the pericardium partly covered and
concealed, their absolute weight exceed
that of the fetal lungs, and they
are specifically lighter than water.
The cases of presumed infanticide
must be very few indeed in which
the medical priest can have to deal
with such strong evidence of respi-
ration as would meet the description just
given. His testimony is much more
likely to be required in instances
where the function of respiration has
been but imperfectly established, and
where much greater doubt, must
exist. It very seldom happens that
respiration is fully completed in the
new born child. "It is not a
sudden but a gradual process,
so rarely, perhaps, never completed
in a few respiration, and very often
remains incomplete and partial after
many hours, days, or even weeks."

Imperfect respiration may be presumed when the air cells are seen developed in those portions of the lungs which are nearest to and most readily accessible by the air—the margins and concave surfaces of the upper lobes, particularly those of the right lung. Here it must be that insufflation gives rise to the same appearance in the lungs as are produced by imperfect respiration. Simple inspection of their external surfaces would prove at once a simple and reliable test.

The difference previously adverted to in the specific weight of the lungs in the fetus, and after respiration forms the principle of the most important and interesting test.
of live birth. The test cannot be supposed directly to prove this, but simply establishes the fact of respiration, leaving quite undetermined of course the question at what time the respiration had taken place. As already stated, then the fetal lungs are specifically heavier than water and when placed in it will of course sink, but after their distension by air they are specifically lighter and consequently will float. The conclusion derived from this fact, is, that if the lungs float it is from the presence of air and consequently the child must have breathed, if on the contrary they sink air has not been admitted into them and therefore respiration has never taken place. But to
this it is objected. 1. That the buoyancy, produced by the lungs, may be due to other causes than the act. urine of air in respiration 2. That the child may have been born alive and yet the lungs sink in con-
sequence of disease or of imperfect respiration.

The grounds upon which the first of these objections rests are that the air giving buoyancy to the lungs, may be derived from putrefaction, from emphysema or from artificial inflation.

The effects of putrefaction upon the lungs vary considerably, apparently owing to the amount of fluid contained within their texture and the degree to which the process has at-
ained. It is not always attended by the formation of a sufficient
quantity of gas to enable the lungs to float. The gas developed in the first stage is never in sufficient amount to give them buoyancy, and it is only at this period that any doubts can be entertained, that is before the other more certain signs of intreparation have become evident. It has been shown by the experiments of Walker and others, that considerable intreparation was requisite to cause the lungs to float and when this is the case the circumstances in which it depends can be so readily appreciated that any possible error on this point may easily be avoided. The air developed from intreparation is confined to the surface of the lungs, producing large irregular vesicles arranged principally
between the lobes, and on their margins, and what is most important, upon pressure the air so produced may be expelled and the lung will sink, which is never found to occur when they have been distended by natural breathing or insufflation.

When insufflation has advanced so far that the odour, the change in colour and diminished consistence leave no room to doubt their real condition, the means of discriminating between the buoyancy given to the lungs from this cause and that of respiration is clearly impossible. No certain mode of doing so can be ascertained. Yet it was asserted by Mare, that upon squeezing out from sections of the lungs the matter developed by insufflation they will sink if they are from a child born
dead, but on the contrary if they are from a child born alive they will notwithstanding this continue to float. Considerable importance has been attached by some authorities, and in particular by Casper, to the fact, that the process of intraembryonic is set up later in the lungs than in almost any other texture of the body except that of bone, so that if other parts of the body under examination be found unaffected by intraembryonic the presumption will be that the floating of the lungs is assuredly not due to that process. In the whole therefore the conclusion evidently is that this objection raised against the floating of the lungs as a proof of respiration cannot be
considered as one of any practical importance.

With reference to Emphysema, which mortified condition of the lungs has been taken as an objection to the value of the hydrostatic test, it may be positively declared that no such state can be found independent of respiration. If produced then from respiration the objection is absurd for evidence shall always exist of the child having breathed. Cases have been recorded by Chaussier, Schmidt and others where it was observed that the lungs contained air which was derived neither from inspiration nor respiration. Such a condition may be illustrated by the following case which occurred under the observation of Dr. Guy. "I examined he says,"
the body of a mature still born foetus within forty eight hours, after its extraction by instruments. There was not the slightest trace of putrefaction in the lungs or in any other part of the body, there was no change of colour, no softening of texture, no putrefactive odour, and with the exception of a residue the apex of a leaf on the surface of one of the lungs, no formation of gas. The lungs, which were gorged with blood, were extracted, put into a gallipot, and carried in my pocket about two hours, at the end of which time the entire surface of the lungs was found studded with residues, some of them as large as a pea and others smaller than a pin head. What was observed here, and
what undoubtedly had been the case in those instances similar to it which have been recorded, war simply the result of incipient putrefaction. Other careful observations made subsequently have not in any way tended to confirm the supposition that it is owing to any other cause than putrefaction. In such cases the air is contained in the cellular tissue and easily expelled by pressure.

A more important and forcible objection brought against the hydrostatic test is that of artificial inflation. The numerous careful experiments which have been instituted by Schmidt demonstrate the ease with which it may be performed.
under skilful management. But considerable difference of opinion exists as to the extent to which inflation can be carried in expanding the lungs. In no instance does it appear to have succeeded in completely filling the lungs and causing them to resemble those that have naturally and fully respirated. Some very careful experimenters have totally failed in the majority of cases, to inflate the lungs to any appreciable extent. In short, to inflate the lungs successfully requires considerable skill and caution and in every case is attended with difficulty, and the very knowledge of this fact it is apprehended tends greatly to weaken the force of this objection to the hydrostatic test.
The whole difficulty would appear to lie in distinguishing between the effects of imperfect respiration and those of inflation. The hydrostatic relations in both instances appear to resemble each other so closely that no sure mode of distinguishing them can be adopted. From the experiments of Guy and Stille on this subject, it results that the degree to which pressure is carried may be in many cases successful in discovering a difference between them. "If pressure short of injuring the texture of portions of lung destroy their buoyancy, then we may safely assume that inflation has been practised, provided only that the lungs have neither been very incompletely disturbed, as in imperfect respiration..."
our completely distended, as a perfect respiration or complete inflation. In both these cases, we must remain in doubt, nor can any being help us out of our difficulty. These circumstances which may occasion the sinking of the lungs of a new born child and that cause them to assume the hydrostatic relations of the foetal lung, come now to be considered. Cases must be extremely rare in which the entire lungs of the foetus are so disorganized that no portion of them will admit air. But manifestly such a condition cannot strictly be brought under the applicability of the objection. And it may be confidently affirmed that no instance is known of
disease attacking the whole lung of the new born child and its density so increased that no part of it will float. Examples have been adduced by several authors to show that its buoyancy may be destroyed from congestion of blood or consequence of suffocation. But in these circumstances the blood may be very easily pressed out and the lung made to float. No disease, it is maintained, can attack the lung of the new born child so as to destroy the buoyancy of every portion of it. A few instances have been observed, where respiration has been undoubtedly established and yet the lungs when
examined after death have been found to sink when placed in water. The objection to the test on this ground seems to be well founded. The following is recorded by Taylor and assuredly it proves the soundness of the objection. In one the case of a mature male child the lungs sank in water although the child had survived its birth for a period of six hours. In the other the case of a female twin, the child survived twenty-four hours and after death the lungs were divided into thirty pieces, but not a single piece floated, showing therefore that although life had been then
contracted, not one thirty-fifth part of the structure of the lungs had received from respiration sufficient air to render it buoyant.

The difference in absolute weight which exists between the fetal lungs and the same organs after respiration has been made the basis of two other tests for the decision of the question of respiration. The increased amount of blood which is found in the lungs after respiration increases as a consequence their absolute weight and also their weight as compared with that of the body. The weight of these organs according will bear a certain ratio to the degree of their expansion, and the difference in this respect is such as to furnish a means...
whereby the existence of respiration may be ascertained. This is one form of the test. The other, which was first advocated by Blonquenet, is founded on the relative weight of the lungs to that of the body before and after respiration.

With reference to the first form of the static test, it may be observed that if any constant average weight could be established to exist before and after respiration, such a method would prove very useful in deciding the question of live birth. Or if the extreme weight it has been remarked, to which the foetal lungs can attain, could be fixed, then in any case where that standard was exceeded, there would be evidence of respiration. How the result of numerous observations by
Various authorities show that the absolute weight of the lungs in a test can be applied only to a very limited number of cases. In some instances, the lungs of still-born children are found to have a greater weight than those of children who have inhaled, so that if extremes be taken, confidence could very seldom be placed in the method of testing. And the difference in weight between the facial lungs and those which have imperfectly respired is found much too small to prove useful. Such methods, however, may be valuable sometimes in tending to confirm the evidence of respiration drawn from more certain sources.

The test proposed by Placequet is liable to objections of a similar
Kind. As a result of his experiment, Ploucquet was led to believe, that the proportion which the weight of the lungs bears to that of the body after respiration was increased to double what it was in the Jaxum. But the abundant observations which have been made subsequently show that any such ratio is that given by Ploucquet is quite in-correct. All those indeed who have experimented with the view of determining the value of the test appear to have assumed average ratios different one from another and none have confirmed the ratio stated by Ploucquet. The principle on which the test is based is undoubtedly correct, but it would be unsafe to attach any value to it as a means of
deciding the question of respiration. If such differences exist among those who have made observations for the most part upon children who have fully recovered, where assuredly the test can never be required, much less likely can it be of any use in cases where the function of respiration has been imperfectly established. Such a test therefore is alike useless and unnecessary.

Other tests have been in favor of the existence of respiration, such as the color of the skin, their position, and their color and density. Very marked changes are to observed, no doubt, in these respects when the function has been performed completely or to any considerable extent and the evidence
they thus afford may prove very useful in corroborating that taken from other sources. But on the other hand when respiration has been imperfect any signs they can possibly give must be unsatisfactory and deceptive.

Again any conclusions that can be drawn from the shape and size of the thorax and the position of the diaphragm must be very uncertain. No appreciable change can be remarked in these structures unless the respiration has been complete or nearly so, and in such circumstances the evidence thus derived can never be required. Although, therefore, many of the preceding tests may be certain and reliable in cases when respiration
has been perfect, yet in doubtful cases of live birth, which are most likely to occur to the observation of the medical juris, they must be valueless.

Such then are the sources whence evidence can possibly be derived to prove the establishment of respiration. There is not much likelihood of the hydrostatic test being obtained by any of those circumstances which have been urged as objections to it, and which are for the most part only theoretical. If it gives evidence of the existence of respiration and this is confirmed by the static test, the conclusion is unavoidable that the child has lived, and the applicability of any objection, that can
be taken to it, to the case in question will remain to be shewn by the objector.

Assuming respiration to be established, then still remains the question—When did respiration take place—was it before or after birth? For it is settled on unquestionable evidence that respiration may take place previous to birth. The child may have breathed in the womb, in the vagina or during the delivery. The occurrence of asphyxia uterina is exceedingly rare and is only observed to happen in circumstances when it is necessary to introduce the hand to expeditiate the delivery, or when instrument have been applied for
that purpose. A much more common event however is that of asphyxiation after the birth of the head and while the body of the child yet remains in the maternal passage. Such a fact as this is believed by some authorities to cast much doubt upon the question of live birth. The possibility of asphyxiation happening during the birth is then by far the most important consideration in the question. It has been declared by some to be very uncommon but most obstetricians of experience assert quite the contrary. Ritge or German obstetrician of high standing, from the frequency with which he has observed it, considers
it not even exceptional. " The very fact of respiration occurring under these circumstances shows that there can be no serious obstacle to the delivery of the child, and this is attested by almost all those who have observed it, the labour being completed usually with great care and safety. If any obstacle has really existed, such a fact can always be discovered. It must have been from malformation on the part of the child or of the mother, and the cases that have been recorded of death during the birth distinctly show this. The objection to respiration as a proof of live birth, as we apprehend, satisfactorily answered in the following
..."uterine respiration cannot never come in our way in such trials, [for infanticide,] for it takes place only under circumstances which render manual aid necessary to complete the delivery. Vaginal respiration is also as far similarly circumstanced." And again, "it is perhaps possible that in tedious labours, air may reach the child in the passage and be intubed by other means, besides, the intubation of the hand; at the same time such cases are by no means likely to occur in legal medicine, as the labour must be tedious, and consequently is not easily concealed. It appears, therefore that the possibility of such..."
expiration before the close of labour
from an objection to the employ-
ment of the hydrostatic test, only
so far as it may occur in test.

even natural labour. Now, inde-

scently of expiration being
exceedingly rare in such circum-
stances, the objection thus consti-
tuted is important only by
preventing the inspector from re-
lying on the test in particular
and known circumstances, not
by being apt to lead him into
error, because the fact of the
labour, having been tested,
may always be ascertained by
moral evidence. " If the lung,
have been fully expanded such
an objection on that of exterior
and vaginal respiration is quite out of the question; in any other case, the great rarity of such a conjunction of circumstances as is indispensable for the occurrence must prove a sufficient barrier to it. Having now considered the evidence of live birth drawn from the condition of the organs of respiration, there still remain to be examined other sources of information which may aid in determining the question. Immediately after respiration is established the foetal peculiarities in the circulation begin to disappear. The ductus venosi, the ductus arteriosus and the umbilical arteries
and veins become gradually closed, and these changes are very useful in determining other questions in cases of infanticide; but when taken to prove the existence of live birth in doubtfull cases, their evidence must be very vague and illusory. The closure of the vessels is no doubt prove that the child was born alive, but on the other hand, their Kat Emer would by no means have the converse. In very irregular manner too, in which they do become obliterated even when respiration has been complete and established for some time, shows that such a case of live birth would be imposible even in those
circumstances. It is seldom that any appreciable difference can be observed in the size of the vessels immediately after live birth, their closure is a very gradual process in most instances, and is not a few very uncertain.

Much more valuable evidence is believed to be obtained from the condition of the umbilical cord. Bichard was the first to make observations upon the state of the cord in children born alive and in children still born. In the former, the part of the cord attached to the child, immediately after birth begins to wither and desiccate, which is never seen to be the case in the latter. The process of desiccation
is usually completed about the fourth day, and the cord ultimately drops off about the tenth. That portion of the cord on the other hand which remains attached to the placenta decomposes and putrefies. It was therefore inferred by Billard that desiccation is a vital process and can never take place in stillborn children. Desiccation however does not invariably happen in the living child. Instances have been mentioned by Ecszer, Sommering and others where instead of withering and drying away, the cord putrefied. And in one case which came under my own observation I remarked this putrefaction taking the place of the ordinary process of
Acrocæration, the child at the same time too perfectly strong and healthy. Eleaner has remarked a complete desiccation of the cord in two stillborn children, but those cases, and other similar to them, do not at all invalidate Billiards statement, for it was remarked in them that the process did not begin immediately after birth, it was not until several days had elapsed after birth, and in no instance was there any indication of the separation of the cord.

If on examination, the stomach of the child be found to contain food, solid or liquid, the presumption is very strong that the child must have been born alive. If the intestines, or be found
 Completely emptied of the meconium, there is a strong presumption in favor of live birth, for in still born children, though some of their feces accumulation have been expelled at all, still the bowel will invariably be found to contain some portion of them. The condition of the bladder too is believed to be of some importance, but the evidence it gives must be very uncertain and not to be relied on in the same manner as on that afforded by the state of the other viscera just mentioned. It is said that if found empty the presumption is in favor of live birth, but it is common enough for the bladder to remain unemptied for days after birth. In living
children. It may have been emptied beside during labour.

It must be asserted then that there is no evidence of live birth independent of respiration, and yet it is quite possible that a child may be born alive and yet not respir. Sufficient time may then be allowed to destroy an infant before any attempt has been made by it at respir.

ation. The case must be excessively rare in which any presumption can be reasonably entertained that a child had been born and had died under these circumstances. The only evidence which could possibly lead to such a presumption can be where external marks exist
of injury, fairly attributable to violence, while the blood was circulating, and of such a nature and extent that they could never have been caused during labour. Devergie mentions a case, where the infant had not expired and yet the charge proved "by the existence of extensive wounds and marks of great violence on the head with copious effusion of blood." There can be no means of deciding positively then whether a child has been born alive or not independently of respiration. In such a case as that given by Devergie, there no doubt may be a pre-cognition of live birth, but assuredly nothing more.

Robert More
Thesis

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Infanticide

Robert Moin