THE NEAR-DROWNED AFTER A SUCCESSFUL RESCUE

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When an individual child is taken apparently dead, from the water the first concern is the re-establishment of heart beat if this is absent, and of respiration. In a major epidemiological study of fresh water drowning accidents (The Brisbane Drowning Study) we have been able to look in detail at subsequent events in survivors. Detailed data is available for fresh water cases only, but we have considerable anecdotal and case history experience with salt water cases as well.

SURVIVAL RATES

Of all unsupervised children who lose consciousness in fresh water, almost exactly 50 percent will survive. The survival rate in such circumstances is higher in swimming pool immersion accidents, and lower in creeks and rivers where the extraction time tends obviously to be longer. The data for surf rescues is approximately 75 percent survival. Whether this difference is due to the altered pathophysiology of drowning in the two types of immersion medium is doubtful; it is more likely that a child in difficulties in the surf is extracted more quickly than a child overlooked and drowning in a home swimming pool, and survival rates probably are measuring the immersion time (and by inference, the degree of anoxia).

Survival rates from Royal Navy data are low, but the complicating influence of icy water conditions makes comparisons very difficult to interpret. One has evidence from The Brisbane Drowning Study that colder water (but not freezing) offers protection from cardiac and cerebral anoxia up to a point, but there comes a stage as the water cools further when any advantage is lost because of complicating cardiac effects due directly to hypothermia.

TIME TO FIRST GASP

A common question that arises for all involved in rescue and first aid work is "how long should one press on with resuscitation if no vital signs return?" We have now personally interviewed the parents, resuscitators and medical officers involved in over 70 extractions of an apparently dead child from the water. In those cases who survived (56 in our series), the median time until the first respiratory gasp was 5 minutes, with a range of 15 seconds to 60 minutes. In all but two cases of survivors, respiration was established within 25 minutes after extraction from the water, irrespective of the skill of resuscitation, In most cases the response was very quick. One child who did not respond until 25 minutes after rescue, had a stormy several days in intensive care, but has recovered completely with a normal IQ measured by formal psychometry. In two cases (4 percent) there was no gasp until between 30 to 60 minutes after rescue, and both children have suffered mental retardation and physical damage (spastic quadriplegia). At water temperatures encountered in tropical and subtropical Australia, I personally feel that there is no point in continuing resuscitation after 60 minutes. A note of caution is needed here, as one has to be sure that one is not dealing simply with a frozen or near-frozen victim, rather than a dead one. It is well known from Naval experience in the Northern Hemisphere that vital signs may not return for after 1 hour if the individual is very cold, but prognosis may stll be acceptable.

WHAT HAPPENS DURING RESUSCITATION

Our experience with fresh water accidents is that about half the would-be resuscitators panic and are ineffective in resuscitation. One mother, on seeing her

toddler son on the bottom of the family pool, ran inside hysterically and rang her husband, and only subsequently tried to extract him from the water - a fatal case. About 10 percent of cases were resuscitated by other children; if one is diving or swimming with a child over the age of 8 years, he should be able to give mouth-to-mouth resuscitation and should be trained to this end - “out of the mouths of babes ... “may come succour. Edmonds’ excellent teaching on buddies, in the general context of water safety, is appropriate in this context, and the concept should be extended to older children as well .

Our data from The Brisbane Drowning Study shows that in 50 percent of the cases of survivors, the trained resuscitator just happened to be present, but in only 10 percent of fatal cases. I feel this cannot be just coincidence. This offers tangible proof that trained resuscitation does indeed turn probable fatalities into survivors.

In one-third of the survivors, the first signs of body movement in the hitherto apparently dead child was a chest and abdominal heave leading to vomiting. In the other cases respiratory gasps were the first signs. It is important to be aware of the high likelihood of a copious vomitus (consisting of swallowed water, detritus, and less connnonly food), so that the airway can be maintained. This vomit, is in my experience, a very good prognostic sign. In 90 percent of cases consciousness returns within 10 minutes of the establishment of respiration.

Unfortunately, there is no acceptable data on cardiac action, or on the presence or quality of the pulse during real life resuscitation experiences involving fresh water immersions. From our experience, using anecdotal and case history material, we know of no instance where a child was not resuscitated if a demonstrable pulse was noted in the immediate post-extraction phase. Most resuscitators say, in retrospect, that they were not able to feel a pulse at the time of extraction or rescue.

AFTER BREATHING RESTARTS

In most cases, if gasping starts, normal respiration is fully established within 2 to 3 hours, and often within 30 minutes. In 3 children in our series of 56 survivors, however, respiration subsequently stopped a second time; in one case, this happened several hours after the successful initial resuscitation when the child was fully conscious, and in fact had not been admitted to hospital at that stage. This phenomenon of “secondary drowning” is well recognised in both fresh water and salt water cases, and is probably due to aveolar collapse and surfactant loss due to the lungs containing large amounts of water. I feel that all resuscitated cases must be admitted to hospital for observation for 24 hours at least. In spite of the voluminous literature on electrolyte and haematological changes after salt and fresh water drowninqs and near-drownings, in no case did we encounter any evidence of hyperkalaemia or haemolysis in survivors.

Some degree of cerebral irritability is common in the first 12 to 18 hours after resuscitation. In approximately 10 percent of cases this is quite dramatic, and produces spasms which are provoked by non-specific stimuli. High pitched cerebral crying or screaming and Biot breathing may also be observed. In my experience this rather worrying pattern in the first few hours after rescue is in no way a grave prognostic sign.

MENTAL FUNCTION IN THE SUCCESSFULLY RESUSCITATED

We have undertaken formal psychometric studies in 33 children who were over the age of 3 years, and who survived. The median IQ of survivors is 110, which is at least 6 points higher than that for the general population. To explain this surprising (but heartening) finding, it seems inescapable that survivors are being selected in

some way. Perhaps it is the brighter more adventurous child who gets into difficulties in the first place. It may be that more intelligent parents are better resuscitators, and their children are more likely to be more intelligent on that account. Whatever is the reason, the outlook for mental function is very good indeed, and one should certainly press on with resuscitation efforts with a full knowledge that if one is successful, in 95% of cases the child will have a normal overall IQ. In one of our cases (a domestic bathtub immersion) the child was resuscitated after 40 minutes, but is grossly brain damaged with amentia. I have also treated one case where the measured IQ in this survivor (first gasp at 60 minutes after extraction) has increased from almost immeasurably low levels at one week, to 97 several months later, but this is unusual.

Unfortunately, it may well be that the prognosis is less favourable for adults who are resuscitated from similar accidents, but there is no published series yet to give accurate data here. We also do not know whether salt water immersion victims are different in this context. My impression is that it may well be that there is less likelihood of brain damage after a successful salt water rescue and resuscitation.

We have encountered no emotional after-effects whatsoever in long term follow-up studies of these near-drowned children. 50 of 54 personally examined children in this series have total amnesia for the immersion event. Only 3 of these showed any fear of water subsequently, and an almost universal response by parents was that the child was in no way more cautious of water hazards after his ordeal.

PHYSICAL SEQUELAE

All but one child of the 56 survivors (a consecutive unselected series) were completely unchanged physically after the near-drowning. I personally examined 51 of the children neurologically and there is no evidence of any hard neurological signs in all but one of these. No child suffered recurrent respiratory problems or middle ear difficulties subsequently. Pulmonary interstitial fibrosis has been reported in the literature in at least one case The one child with neurological side effects had gross spastic quadriplegia which has remained as a permanent handicap after the accident. This is the one child who also has amentia, and he manifests extensor spasms triggered by non-specific stimulation. This is not to say that other side effects do not occur, but they are rare. The known sequelae after near-drowning with hypoxic brain damage include dysarthria, extra-pyramidal features,upper motor neurone signs, and peripheral neuromuscular complications. X-ray changes in the chest are almost inevitable after rescue. Perihilar pulmonary oedema, and generalised pulmonary oedema are the most commonly observed findings. It is generally considered that these changes are probably secondary to hypoxic lung injury and usually clear within 3 to 5 days. No lung changes either clinically or radiologically are usually apparent within 5 days after a successful rescue.

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