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Use of Hypothermia in the Treatment of Athletic Injuries

Robert E. Sink

USE OF HYPOTHERMIA IN THE TREATMENT OF ATHLETIC INJURIES

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Robert E. Sink

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Accepted:

Florence McAfee
Florence McAfee
Instructor

Approved:

[redacted]
John W. Masley
Advisor

Date: 8/10/61

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CHAPTER I

INTRODUCTION

The purpose of this paper is to introduce the reader to HYPOTHERMIA and relate its importance to the treatment of athletic injuries. The term HYPOTHERMIA is composed of two words: HYPO, which refers to any unit of molecular structure which is below considered normalcy, in quantity or quality, and THERMO, which has reference to the presence or absence of units of heat. The definition of the term HYPOTHERMIA as stated by Herbert, Severinghaus, and Radigan is "The reduction of normal body temperatures to levels at which there is a significant decrease in the metabolic demands of the vital tissues."[1] This definition seems to put the subject of this paper into the realm of medicine and rather far removed from the particular field of the writer. However, this is not the case, as anything concerned with the control of the physiological processes of the human body should be of interest to all physical educators.

In the preparation of this paper the writer was inspired by the apparent inadequate attention given injured athletes by members of the coaching and training professions. The apparent inadequate practice of the coach or trainer in attending to the injury of a young athlete is not to be condoned, but one feels a certain obligation to rationalize for these men by stating that the entire fault

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[1]C. L. Herbert, J. W. Severinghaus, and L. R. Radigan, "Management of Patients During Hypothermia," Anesthesia et Analgesses, II (January-February, 1957), 24.

is not theirs. The fault lies in the weak scientific background that their profession has been depending upon for knowledge. Great steps have been taken by the leaders in the athletic and coaching professions to reinforce the background knowledge pertinent to their field. These men have accomplished this by encouraging scientific research in problems relevant to their field. This was only the first step, for after the research was completed and substantiated, a means of application had to be instilled in the men who would be putting these facts into practice. This would be accomplished by inspiring interest in the men in the field.

The contents of this paper will be basically composed of a digest of the history of the medical profession's struggle to elevate itself to the professional heights it occupies today, and the history of the therapeutic application of cold by the interested peoples down through the years. The paper was written to reveal in a chronological sequence the information that will introduce the reader to the subject of HYPOTHERMIA and given an understanding of the importance of HYPOTHERMIA in the scientific treatment of the most seemingly insignificant injury.

CHAPTER II

ANCIENT CIVILIZATIONS

Egyptian

The Egyptian civilization is recognized as one of the healthiest during this period. The reason for this, of course, is supposed to be the fact that they closely related the treatment of illness of any kind with religion. A search for information that might make it feasible to incorporate any direct belief of therapeutic value used by these people in connection with HYPOTHERMIA, was almost futile. There is only the fact that there was a connection between the primitive beliefs and the satisfied mind which was accomplished through religion. There were no facts to substantiate the therapeutic treatment practiced by religious heads. Herodotus in the fifth century referred to this point:

> "The manner of life of the Egyptians is this. They purge themselves every month three days successively, seeking to preserve health by emetics and clysters for they suppose that all disease to which man is subject proceeds from the food that he eats."[2]

The example above indicates the unscientific reasoning of the Egyptians. There is not much to say for this earliest of civilizations contribution to medicine. It seems we can give them credit for the establishment of a very inadequate prognostic procedure. This

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[2]B. W. Lambert and G. M. Goodwin, Leaders in Medicine, (New York: Harper Brothers, 1942), p. 29.

poor prognostic procedure was a step in the right direction. In concluding, this early civilization of the Egyptians took on aspects of primitive ideas and concepts of prehistoric people. There is a definite indication of a correlation between mystery, magic, and medicine of the prehistoric peoples and religion, magic, and medicine of the Egyptians.[3]

Greek

It appears that among the ancient Greeks the earliest principles of scientific medicine were formulated. It seemed also among these same Greeks that a complete separation of religion and medicine took place. The Greeks took the magic and mystery from medicine and introduced observation, logic, and deduction. This step alone was probably the one most important step ever taken in the whole long history of medicine. The most famous of the examples of this time is the Hippocratic Oath:

> "I do solomnly swear by that which I hold most sacred: that I will be loyal to the profession of medicine and just and generous to its members;
>
> "That I will lead my life and practice my art in uprightness and honor;
>
> "That into whatsoever house I shall enter, it shall be for the good of the sick to the utmost of my power, I holding myself aloof from wrong, from corruption, from the tempting of others to vice;

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[3] H. W. Hagard, Mystery, Magic, and Medicine, (New York: Doubleday, Doran, and Co., 1933), pp. 13-14.

> "That I will exercise my art solely for the cure of my patients, and will give no drugs, perform no operation for a criminal purpose, even if solicited, far less suggest it;
>
> "That whatsoever I shall see or hear of the lives of men which is not fitting to be spoken, I will keep inviolably secret;
>
> "These things I do promise and in proportion as I am faithful to this my oath may happiness and good repute be ever mine--the opposite if I shall be forever forsworn."[4]

Nothing written in the intervening two thousand years seems to come close to giving the medical profession any more ethical guidance, than the above oath. This quest for proper medical attention for humanity by the Greeks was possibly hampered by the superstitious rebellion of the majority. The fathers of medicine did do things in the advancement of medicine that they would not do openly, but they carried on these experiments and dissections of the human body behind closed doors.

The Greeks still clung to a few handed-down ideas of therapeutic applications. One such idea mentioned by Hagard was, an expectant mother was given drugs to induce labor and was bounced up and down on the bed, while a group sang ceremonial songs.[5]

The Greeks contributed things such as: classification of the animal world, anatomical studies of the human anatomy, and

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[4]Francis Adams, The Genuine Works of Hippocrates, (Baltimore: Williams and Wilkins Co., 1939), p. viii.

[5]Hagard, Mystery, Magic, and Medicine, op. cit., pp. 18-35.

studies of the physiological functionings of the human body. The Greek medical leaders led and inspired by Hippocrates laid out a difficult plan for the men of medicine that followed them. One of the sayings of these men was, "to know is one thing; merely to believe one knows is another. To know is science, but merely to believe one knows is ignorance."[6]

Roman Medicine

The men who were to inherit the principles of Hippocrates were of another civilization. These men were seemingly still lost in speculation. These people were evidently more interested in the converting of followers to their school of thought than human welfare. Once and once only did Roman medicine reach a peak to almost equal that of Hippocrates. This progress was made in the hands of such men as Celus, Dioscorides, Aretaeus, and Galen. It was Galen, the last of the great ancient physicians, that closed the door that Hippocrates had opened. He established theories from logic that were good, but sometimes incorporated them with bad premises. At the very time of Galen's advancements the Roman Empire was starting to decline, and as the Empire declined the medical practitioners became decadent. The "Authority of Science," compiled by Galen, with all of its flowery theorizing, became almost the law of the land. It advanced the idea that it was much better to argue the old points in fringe and lace discussion than original searching and proving.[7]

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[6]Hagard, Mystery, Magic, and Medicine, op. cit., p. 33.

[7]Lambert, op. cit., p. 34.

Arabic Influence on Medicine

The scourge of the East swept through eastern and central Europe. The zenith of the Asians was to take on the effect of strengthening the position of the Galen school of thought. The Arabic influence would not seem to warrant much attention here.[8]

Dark Ages

There seemed little to write about the medicine of this particular period. These dark years produced nothing but sterile disputations. We have to look to another field for any notable progress contributing to medicine. This progress stems from the strong belief in pharmaceutical results. The result was of a social nature rather than medical, as the need of the people for help appealed to the money hungry, and more adventuresome men of pharmacy. The demand for pharmaceutical materials led to explorations. These explorations brought about the discovery of America and many other new lands.[9]

Renaissance

This period in the history of medicine and its relation to HYPOTHERMIA produced some great and very worthwhile contributions. It is hard to believe that the medical world did not know the whole of the anatomy of the human body, however there were three great men who furthered the knowledge of the human body: Paracelsus and his mineral medicaments, Vesalius and his study of human anatomy, and Pare who made the first notification of the possibility of decreasing the severity of an injury by application of a medicament or abusive treatment, such as bleeding.

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[8]Hagard, Devils, Drugs, and Doctors, op. cit., p. 391.

[9]Ibid., pp. 392-393.

These men were evidently in the minority and were responsible for only a trivial portion of the medical practice of the time. For the most part medicine and its practice was left to the barbers, executioners, vagabonds, and quacks who made diagnosis by the contents of the urine, the stars, and palmistry.[10]

The great discoveries of this period it seemed were to have very little importance until later.

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[10]Hagard, Mystery, Magic, and Medicine, op. cit., pp. 52-64.

CHAPTER III

SEVENTEENTH AND EIGHTEENTH CENTURY MEDICINE AND EARLY HYPOTHERMAL EXPERIMENTATION

This era of medicine could be centered around the discovery of William Harvey. Harvey demonstrated the circulation of the blood of humans. His work in this field focused the attentions of the medical men of the time toward two of the bodily processes, the circulation itself and respiration. Harvey's work was purely speculative as to how the blood went from the arteries to the veins, for no one up to this time had seen the capillaries.[11]

The discovery of the microscope brought about the further investigations leading to the finding of the capillaries and the aveoli of the lungs where the exchange of CO_2 was made for oxygen.[12]

It was during this period that an insignificant practice of an army physician by the name of Serverino who packed soldiers' legs with snow and ice before amputation was found to be helpful.[13] It was evident that this first therapeutic application of cold for pre-operative treatment was haphazard; it could not be controlled as to degree of cold. With all of these advancements in medicine, the practice of medicine in general was still in the hands of the unqualified.

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[11]Truman J. Moon, P. B. Mann, and J. H. Otto, Modern Biology, (New York: Henry Holt and Company, 1951), pp. 25-26.

[12]Lambert, op. cit., p. 51.

[13]J. D. Wassersug, "How Much Cold Can We Stand," Science Digest, VII (December, 1958), p. 24.

Eighteenth Century

The attitude of the eighteenth century mind was in the nature of reaction. The uncriticized discoveries of the seventeenth century were now to be criticized by the thinking men of this period. For the most part it was a period of interweaving of the sciences as the mathematicians were having their say-so about quantitative figures supplied in the seventeenth century. There was hardly any of the rugged work of searching for any new facts going on, just philosophizing. The most highly successful physicians of the time were still not qualified for the job and were nothing more than socially prominent quacks.[14]

Robert Boyle, a chemist in the seventeenth century, made this statement concerning an observation of his regarding the effects of cold upon the human body: "it may seem to most men needless curiosity to examine solicitously by what criterion or way of estimating the effects of cold on bodies and the degree of it are to be judged; since coldness being a tactile quality, it seems impertinent to seek for any other judges of it other than the organs of that sense, whose proper object it is."[15]

When in 1714 Gabriel Fahrenheit invented the thermometer, objective measurement of "coldness of bodies" became not only pertinent, but a subject of interest to biologists. They turned eagerly to experimenting with the effects of cold upon plants and animals.[16]

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[14]Lambert, op. cit., p. 60.

[15]Ibid., p. 63.

[16]Ibid., p. 65.

The research of this period indicated there were no fundamental scientific advancements made during the eighteenth century. The advancements were made in the fields of mathematics, physics, and invention rather than medicine. However, if it were not for these other sciences, medicine would never have been able to take the great leaps it was to take in the next two hundred years, and thus we would know less of HYPOTHERMIA.[17]

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[17] Ibid., p. 67.

CHAPTER IV

HYPOTHERMIA AND THE ERA OF MODERN MEDICINE (Nineteenth and Twentieth Centuries)

This was a period of transition where there was no evidence that the medical profession was going to go through a revolution as profound as the social revolution that mankind was to pass through, and the industrial revolution that came about because of the interest in physics, chemistry, and mathematics. The acute devotions of the humanitarians of the time were directed toward bringing about a self acquired dignity to men.

At this time interest was transferred from the broad scope of medicine to one phase of it, the use of some element to alleviate the pain that is associated with surgical operations and childbirth. There were three reasons: first, this alleviation of pain indicated that the trend was toward comforting the patient; second, the position of a woman in the civilization was an index of the advancement of that civilization; third, it was the quest for a better anesthetic; that HYPOTHERMIA aroused the interest of the medical world.

Prior to the middle of the nineteenth century there was no record of such a word as anesthetic. There had only been a very few recordings of the application of any pre-operative attention other than those connected with mere chance of those derived from intoxicating spirits.[18]

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[18]Hagard, Devils, Drugs, and Doctors, op. cit., pp. 92-95.

The controversy over anesthetics began early in the nineteenth century when Sir Humphry Davy in England experimented upon himself with nitrous oxide. He stated, "as nitrous oxide in its extensive operation appears capable of destroying physical pain, it may probably be used with advantage in any operation where there is not likely to be great effusion of blood."[19]

Forty-four years later Horace Wells of Hartford, Connecticut, began to use nitrous oxide in dentistry and thus was the first man to clinically apply anesthesia. Two years later William Morton, after experimentation with ether, used it in his practice to keep down on the pain. Much to his surprise, the first application of ether brought a statement from the patient, of his own volition, that he had experienced no pain. Morton then applied this same anesthetic in the operating room; for he was also a recognized doctor. It was a success in this application, also. The fact still remained that the word anesthetic was not used in the language. This established the use of anesthetics as a brand new phenomenon; for man is quick to tag a name to any phenomenal happening.[20]

Parallel to Morton's ether discovery and application was the interest in the use of this anesthetic to remove pain from childbirth. This revelation met much opposition from the theological world. There is however still pain with child bearing in most instances. This cannot be overcome with the anesthetics that we know today.

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[19] Ibid., p. 98.

[20] Ibid., p. 98.

The precise name for lowering of body temperature is HYPOTHERMIA; and in warm blooded animals, such as man, "hypothermia refers to a state of subnormal temperature. A normal temperature, which may run from 96.6 degrees F. to 100 degrees F., is maintained in the human body by a tiny thermostat (control) device in the base of the brain. This is the center, too, which is concerned with heat production and shivering, and prevents the sudden temperature drops in the body by stimulating musculature contractions. With a drop in temperature, the body's need for oxygen declines and, consequently, the metabolism or metabolic rate drops. When the body temperature is at 77 degrees F., the oxygen demand is only about 20 per cent of normal. Along with a decline in metabolism, there are decreases in the heart beat rate and in the blood pressure. Later the blood may fail to clot. The blood sugar level will decline. Gradually, breathing slows down, and with further oxygen drop the brain becomes damaged and death may follow."[21] The foregoing description of HYPOTHERMIA for fact goes beyond the limits of any research work which had been done until World War II. Prior to that time evidence indicated that doctors thought that the human body could not withstand any temperatures below 92 degrees F. The arms and legs of soldiers were subjected to refrigeration anesthetic. The arm or leg was packed in ice and a tourniquet applied for two hours or more. After that the needed operation could be performed without further anesthetic. This seemed to be a pre-planned course of

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[21] A. S. Parkes, "Freezing of Living Cells," Scientific American, CIVXC, (June, 1956), p. 106.

treatment. However, to learn of the early modern start of refrigerating human patients, we must skip back to the year 1937 when Philadelphia doctors tried it on hopelessly sick cancer patients. The theory used was that the low temperature would tend to arrest the fast spreading cancer cells. The patients were subjected to this mild frozen sleep. They were left in this state for twenty-four hours to eight days, at temperatures of 75 degrees F., with relief from pain and suffering. This form of anesthetic was not only given thought before application but was used (in a mild sense of the word) in desperation.[22]

It is interesting to note that it appears the human race likes to have things tested out and proved for them at the expense of lower forms of life and the effort of someone else. So in 1939 a bit of research was compiled by G. H. Parker.[23] His work indicated that it is often desirable to induce in animals a general anesthesia for operative purposes without the use of drugs. This is particularly true in the study of chromataphores. The desired effects are often to drug stimulation and remain responsive to minute amounts of reagent for relatively long periods of time. The success of his experiments could very well have been the fact that the subjects of his experiments were lower forms of life. This assumption is not meant to be an indictment, for this information contributed by Parker was a step in research.

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[22] Ibid., p. 108.

[23] G. H. Parker, "General Anesthesia by Cooling," (Excerpts from the proceedings of the Society for Experimental Biology and Medicine), XLII, (October, 1939), p. 186.

The following year, 1940, Lawrence Smith and Temple Fay[24] made a scientific attempt at lowering the body temperature and devised a controllable method of packing the patient in ice. It was their idea that a person might be subjected to this treatment and have the disease arrested. The disease that was used in the experiment was cancer. The result was that the cancer cells were stopped dead, only to take up their usual speedy growth as the body was rewarmed.

The next year Dr. F. M. Allen[25] of the New York Polyclinic Hospital used only ice or ice water in forty-three amputations, and found that his patients had no pain, shock, or even disturbances of the blood pressure. This investigation by Allen opened the door that many doctors were looking for, the possibility of an open heart operation. The technique used by Allen was not the answer, for ice or ice water had a tendency toward letting the body temperature of the patient go downward uncontrollably.

One would think the direction for further experimentation was to find a way of lowering the body temperature more safely and more precisely. When a person is sick, injured, or fatigued, it is necessary to guard against shock and the post complications of shock. The body is a complex unit composed of many different systems, and the disturbance of any one of which is potentially fatal. Therefore the temperature should probably be dealt with in the most precise and informed way possible.

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[24]Temple Fay and G. W. Smith, "Observations on Reflex Response During Prolonged Periods of Human Refrigeration," Archives Neurology and Psychiatry, IVL (1941), 215.

[25]F. M. Allen, "Cardiac Surgery," New York Polyclinic Bulletin, (1940).

The advancement and acceptance of a process of lowering the body temperature was slow in comparison to the way other things seemed to be moving in the middle of the twentieth century. However the next few steps were taken rather rapidly when one thinks of the length of time that passed by to advance HYPOTHERMIA thus far.

The first necessary step was to prove that HYPOTHERMIA positively contributed to medicine. Duncan McEwan[26] found that refrigeration in the operations on the extremities afforded many advantages. It could be used to ready the patient for the operation as well as the anesthetic, because it does away with the shock and pain, controls hemorrhage and infection, and it eliminates toxic absorption. The important factors of this technique are: first, absolute local anesthesia is obtained with no shock to the system; second, it makes an anesthetic for both the protoplasm and the nerves.

Another research work by Victor Richards[27] disclosed some interesting facts about a few of the polemical aspects of refrigeration anesthesia. The comments by Richards did not favor the possibility of advancing refrigeration as an anesthetic. He made this statement out of the results of his experiments, which he felt resulted in the uncontrollable irreversible changes that effected the nervous and the muscular systems. The work did further prove the already established advantages of refrigeration

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[26]Duncan McEwan, "Refrigeration Anesthesia of the Extremities," Journal of the Florida Medical Association, XXXI, (October, 1944), p. 153.

[27]V. Richards, "Refrigeration Anesthesia in Surgery," Annals of Surgery, CIX, (February, 1944), p. 178.

anesthesia. This work by Richards was the first apparent critical information that was available concerning the subject of HYPOTHERMIA. The next work of research, which was done by H. Ogle Horner[28] was more positive and in favor of refrigeration anesthesia. Horner's small series of twelve cases implied that in previous serious amputations there might have been an error in the preoperative preparation of the patient, or in the application of the ice packs, which if they caused undue pressure on any near frozen skin, would cause an ulcer condition, and contribute to hyperinflammation of the operative area. The other plausible error might have been actually freezing the skin.

At this point the medical profession was obviously concerned with the effects upon the nervous system. They felt that there was a definite causal effect of resistance put up by the vegetative nervous system, which probably in turn encited complications such as trauma, fibrillation, and chilling. The basis for this belief was man's aggression to resist cold by increasing the metabolism rate. Now they needed to find a pharmacodic that would block the vegetative nervous system. When this was accomplished, the cold application then acts directly on the tissue cell oxidation which are greatly reduced. The patient would then be in an apparent state of abated life similar to that of animals in hibernation.

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[28]H. Ogle Horner, "Refrigeration Anesthesia," American Journal of Surgery, LXX, (November, 1945), 201.

The work of Lamborit and Huguenard[29] proved by experimental and clinical studies that the anatomic lesions of the syndrome of the nervous irritation can be opposed by means of a pharmocodynamic agent with a neurovegetative action. This, the "lytic cocktail," is a derivative of dibenzoparathiazine; when this was used the generalized refrigeration and the results were spectacular in the sixty cases cited in their work. It was really phenomenal since all sixty cases were considered as hopeless surgical conditions.

The role of the "lytic cocktail" can be described in terms of the effects of each one of the constituents, and what it affects. "The following act upon the gangliomic synapse: diparcol, procaine, curare, and tetraetyl amonium; the atropine, and phenergan are used to act upon the terminal synapses; centripetal routes are acted upon by procaine and synthetic antihistamines; the hypothalmic centers are acted upon by the phenergan and diparcol."[30]

Along with the discovery that drugs aided in refrigeration anesthesia, came the rebirth of the fact that a reduction in oxygen consumption accompanies a fall of body temperature. This opened up the possibilities that HYPOTHERMIA contributed considerably to the field of cardiac surgery, even those of poor operative risk. The work of Dundee, Gray, Mesham,and Scott bear out this assumption. Their statement, "the advantages, of a state such as we find in hypothermia where in the cellular oxygen requirements are markedly

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[29]H. Lamborit and P. Huguenard, "Artificial Hibernation Pharmocodynamics and Physical Measures," Lapresse Medical, LIX, (October, 13, 1951), 1329.

[30]H. Lamborit, "Artificial in Anesthesiology," Anesthesia et Analgesie, Suppl, IX, (June, 1952), 1.

reduced,"[31] suggests that there was significant proof of the above quotation in the results of the twenty-six cases they dealt with in their study. This type of research was sure to bring the medical profession closer to the solution. The conclusive research by the above-mentioned men and others such as Scott, Collins, Foster,[32] Bailey, Cookson, Dowing, Neptune,[33] and Bigelow[34] directed the application into another very intricate part of the body. The work indicated that the now advanced theories would have some wonderful things to offer brain surgery. They also disclosed that there is a difference in the circulatory functions at different levels which shows an interest in the younger patients and quite possibly the newborn or the about-to-be-born. The general attitude toward HYPOTHERMIA at this time is still tinted with optimism. The only positive step that is anticipated is one to the surgery of the aorta. This is a natural extension since the greatest asset HYPOTHERMIA has is its simplicity.

In 1957 a report of seventy-six cases of poor risk patients undergoing major surgery was made by Albert, Spencer, Boiling, and Thistlethwaite.[35] The conclusive aspects of their report

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[31]J. W. Dundee, Cecil T. Gray, P. R. Mesham, and W. B. Scott, "Hypothermia with Autonomic Block in Man," British Medical Journal II (December 5, 1953), 1237.

[32]William H. Scott, Harold A. Collins, and John H. Foster, "Hypothermia as an Adjuvant in Cardiac Surgery," American Surgeon, XX (August, 1954), 799.

[33]Charles Bailey, Brian Cookson, Daniel Dowing, and Wilford Neptune, "Cardiac Surgery under Hypothermia," Journal of Thorasic Surgery, XXVII, (January, 1954), 73.

[34]W. G. Bigelow, "Application of Hypothermia to Cardiac Surgery," Minnesota Medicine, XXXVII (March, 1954), 181.

[35]Solomon N. Albert, William A. Spencer, John S. Boiling, and J. R. Thistlethwaite, "Hypothermia in the Management of Poor Risk Patient Undergoing Major Surgery," Journal of the American Medical Association, CLXIII (April 20, 1957), 1435.

were: moderate HYPOTHERMIA protects the brain against the occurence of acute anoxia by reducing the cerebral metabolic rate. Adrenal stress reactions were both reduced and delayed. Patients seem not to show the usual retention of water and salt during the post-operative period. Patients tolerated major operative procedures better.

The interest in this hibernation of humans seem to be gaining momentum; for the amount of research done and the articles written to validate this material indicated that the demand or the need is calling for more research. It is very hard to make any predictions as to where it might end, but with the contributions of all the sciences directed toward more research, who knows? With such things as superfluids, which enable man to completely stop all molecular motion, and still have movement, it may be possible for us to assume we are somewhere near solving the problem of many disorders in the physical system through organic treatment.

CHAPTER V

HYPOTHERMIA AND ATHLETIC INJURIES

The game in which a ball is kicked has been played for many hundreds of years, and, as a rule,it has been a rough game. It has been very hard to keep the manliness enjoyed and the risk involved and still control the accidents. Of all sports, football ranks high in incidence of deaths and injuries as compared to other sports. Thus, it is fitting to choose football injuries to incorporate into this discussion. The words of Walter Camp back in 1894 still hold true today. He said, "It is an incalculable blessing to this country that such a sport is so enthusiastically beloved by almost all that part of our boyhood whom nature has endowed with strong passions and overflowing energies."[36]

It should be every coach's desire to prevent injuries in the sport that he coaches. It should also be every coach's even greater desire to take the proper care of the injuries which do occur. The latter desire is one that this writer is concerned with.

We must establish first the fact that athletic injuries are of the nature requiring need for treatment of varying degrees of shock. Past facts and statistics of football injuries are far from adequate. Efforts to gather the facts were not very rewarding.

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[36]Walter Camp, Football Facts and Figures, (New York: Harper Brothers, 1894), p. 56.

Correspondence with several individuals and organizations was thwarted by receiving no answer, or being advised to write to someone else. There were two data sheets on football safety received. One was received from the National Safety Council high school division and one from the National Safety Council college division. Most of the material did not pertain to the specific subject. The writer was furnished the statistics of the injuries sustained by the Illini team for the 1957 season, by Bob Nicholette, trainer for the University of Illinois football team. Included in this were the names of the players and the types of injury they sustained.

In analyzing this information the following statistics were noted:

1. At the University of Illinois during the 1957 season the football team sustained eighty-six injuries. Of the eighty-six sustained injuries fifty-six could possibly have been treated with cold application.

2. The leg and foot accounted for forty-five per cent of all the injuries, with sprained ankles and torn cartilage (knees) most frequent.

3. The arm and hand accounted for thirty-three per cent of all the injuries and ranked second in injury frequency. Fifty per cent of these injuries involved broken bones.

4. Head and neck accounted for thirteen per cent of all the injuries and ranked third in frequency.

5. Shoulders accounted for six per cent of all the injuries and ranked fourth. These injuries were of a serious nature (separations and dislocations).

Concerning the foregoing analysis of injuries on the 1957 University of Illinois football team, the writer assumed that most athletic contests would have a relative number of injuries in ratio to the amount of body contact employed in playing the contest. Thus the possible treatment of these athletic injuries should be of some concern to the coaches and trainers involved. The fact that any injury is a degree and state of organic shock is the premise upon which the writer is going to attempt to connect the importance of HYPOTHERMIA to the treatment of athletic injury. Shock, whether by a knife wound, surgery, crushing, loss of blood, muscle spasms, jammed neck, hyperextension, sprained ankle, et cetera, causes a depression of the bodily functions, either vital or minute, in the damaged tissues of the injured area. If early shock can be prevented from occurring, then the athlete can, in all probability, return to the active list earlier.

Ben Mankowski, assistant trainer at Drake University, says of shock, "Shock is brought about by injury, pain, cold or fear and causes decrease in bodily functions."[37] Many coaches and trainers do not seem to realize the tremendous possibilities of this use of reduction of the body temperature tool. Most of the injuries sustained in football are of the strain, sprain, torn cartilage, pulled tendon, or contusions type. What is the best treatment for the coach and trainer to apply should be resolved by a doctor before advancing with prognosis or treatment of the injury.

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[37]Ben Mankowski, "Shock," Athletic Training News, V, (September, 1957), 4.

There is apparently no need to present arguments about HEAT or COLD treatments. There seems to be no controversy on this particular point. The medical profession and the athletic trainers agree that there should be no treatment of injury with any form of heat for at least twenty-four hours. Picariello, trainer of Long Island University, said, "Ice all sprains and bruises first. This has been a keynote in reducing the recovery period. The early treatment is that of cold and compression and rest to limit the amount of hemorrhage and subsequent hematoma. The latter treatment, heat and massage, is directed at the absorption of the hematoma by stimulating the lymphatic and circulatory system."[38]

Larry Klaus of the University of Wyoming training staff, gives this as a specific treatment for pulled muscles. "As soon as the injury occurs apply ice packs or ethyl chloride spray, at a distance of about twenty inches from the injured area until skin blanches or is covered with a fine frost. The latter is wiped off. The resultant local anesthetic lasts about ten to twenty seconds and relieves the pain and spasm. Patients are encouraged to move the injured member slowly. Continue the spraying exercise until patient is relieved enough to walk about. Place compress elastic bandage on area and encourage patient to walk and stretch intermittently. The next day begin therapy and warm whirlpool or diathermy to bring about hyperemia throughout the area. Apply moderate heat for thirty minutes and

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[38] S. J. Picariello, "Pulled Tendons," Athletic Training News, IV, (February, 1957), 34.

massage, avoiding area of tenderness."[39] Here again the treatment of the patient for early conditions of shock, being induced by muscular contractions, is all important.

In Bill Getzelman's column of the Athletic Training News, in regard to treatment of the type of injuries being discussed, "first do not apply heat for at least twenty-four hours, if there is a chance of internal bleeding of any degree." This statement again brings out the point: if there is injury, watch out for shock and arrest any internal bleeding.

Another type of athletic injury that all coaches and trainers must be familiar with is internal bleeding. Again, we must first understand what has happened before we treat it. A hemorrhage is the escape of blood from the vessels, injured tissue. This injury can be painful to the athlete and insignificant to the coach or trainer.

Dale Bjorkland states, "Immediately apply cold towels (cracked ice if possible) to reduce swelling and increase clotting. Leave application on for ten or twenty minutes. Heavy muscle areas need longer application. Then apply some type of mild rub and keep it warm overnight. Instruct the athlete to drink lots of liquified foods so as to keep the water content of the blood at a maximum. The water also acts as a catalyst in exciting the kidney action and thus the removal of waste products. It will also assist in maintaining body temperature."[40]

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[39]Larry Klaus, "Care and Treatment of Pulled Muscles," Athletic Training News, IV, (April, 1957) 44.

[40]Dale Bjorkland, "Treatment of a Sprain," Athletic Training News, IV, (May, 1957), 35.

There is one other aspect in the use of HYPOTHERMIA in the treatment of athletic injury. This is stated by Fred Wappel, assistant trainer at the University of Missouri. "Another part of the ice treatment is just as important as the ice itself. I refer to pressure. I am of the opinion that many of those using ice have not been using the pressure bandage with it."[41] Mr. Wappel believes that safe thinking would suggest pressure to minimize the swelling and cold applications to reduce movement of blood into the area.

It is apparent that there is quite a difference of opinion in the way the trainers quoted feel treatment of an injury should proceed. However one must realize these men are basing their opinions upon experiences gained with certain individuals with possibly no scientific data to back up every detail of their suggested procedure. It is very easy to suggest treatment and have it tinged with sentiment, such as brand name training supplies, that is not at all relevant to the actual facts concerning the results of treatment.

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[41]Fred Wappel, "Pressure and Cold," Athletic Training News, IV, (March, 1957), 8.

CHAPTER VI

SUMMARY AND CONCLUSION

A summary of the findings of this paper seem to reveal that: first, any profession which expects to be recognized by the people at large as capable in diagnosing and treating injuries must undergo long scientific search for improved and competent procedures of practicing their profession; second, that at the present time doctors and only doctors are recognized by the laws as being able to practice medicine; third, the medical world today recognizes the significance of HYPOTHERMIA as a beneficial instrument in the treatment of shock; fourth, any form of injury that hinders the catabolistic metabolism of an individual from progressing in the manner accustomed by the individual is shock in some degree; fifth, athletics is a field in which many injuries occur and the recovery period is of the essence; sixth, the men in athletics responsible for the treatment of injuries have the best of intentions but their ideas conflict within their profession as well as not agreeing in many instances with the medical profession; and seventh, a real problem of proper care for athletic injuries prevails.

Considering the above it could be concluded that the injuries common to athletic programs many times do not have the degree of severity as those of the surgical kind, but nevertheless must be

treated in the same delicate manner. The prevention and care of injuries in athletics should command the attention of all and every one connected with athletics should accept the responsibility of practicing good and accepted procedures in this respect.

Further, it could be concluded that the important moral obligation of the coach or trainer involved should be: first, to secure the services of a doctor as set down in his school policy; second, to do everything possible to have a properly equipped and up-to-date treatment room available; and third, to be well read on the matter of treatment, so it will be possible for him to follow the prescribed therapy of the attending doctor.

This study indicated the many established results of the use of HYPOTHERMIA. They were: it prevents pain, it prevents shock, it arrests all local metabolism, it inhibits secondary shock, it reduces physical exudation, and it halts production and diminution of absorption of all kinds of toxins.

It could further be concluded that HYPOTHERMIA is an asset in the treatment of athletic injuries and therefore it would be expedient for the trainer and coach to acquaint himself with the values and application and take the necessary steps to provide facilities for effective treatment using this method.

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