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THE INCIDENCE OF HEAD AND NECK

INJURIES IN FOOTBALL

(TITLE)

BY

Ray M. Wurtsbaugh

PLAN B PAPER

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I HEREBY RECOMMEND THIS PLAN B PAPER BE ACCEPTED AS
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Raymond Stoen
DEPARTMENT HEAD

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CHAPTER I

INTRODUCTION

Although there is statistical evidence which indicates that the incidence of football injuries is low compared to the number of participants, one death or serious injury is one too many. Almost every football season has been marred by serious injuries and death.

Head and neck injuries have received a great deal of publicity due to the seriousness of these injuries.

Because of the nature of the game of football, it would be virtually impossible to eliminate all of the injuries that occur without changing the characteristics of the game so drastically that body contact and protective equipment would no longer be necessary. Nevertheless, continuing research on all aspects of the causes of injuries can decrease the severity and the number of serious injuries of the head and neck.

The purpose of this paper, through the review of studies related to football injuries of the head and neck, is to find the causes of head and neck injuries in football and to suggest preventive measures for the reduction of such injuries.

CHAPTER II

HEAD AND NECK INJURIES

A study of Southern California high school football players was made in 1961 by Dr. Richard Alley.¹ The records of insurance companies were used to make a study of all the types of injuries occurring in football. Since this study is comparatively recent it shall be referred to liberally throughout this chapter.

A study was made on every football player who received a head or neck injury. First, a questionnaire was sent to the doctor treating the injured players. Second, a visit was made to the school of the injured player. After the coach and the player were interviewed, the injured player's equipment was examined. Dr. Alley checked the type of headgear and its fit, coaching and conditioning procedures used at the school, and also made a careful evaluation of the seriousness and the type of injury received by the player.

Results of the Study

The study group included 19,413 high school football players from the California area.

¹Richard H. Alley, Jr., M.D. "Head and Neck Injuries in Football," Journal of the American Medical Association, CLXXXVIII, No. 4, (May 4, 1964), p. 118.

Players injured totaled 4,829 or 24.9% of the boys in the study group. Two hundred and three players sustained a head injury comprising 1.0% of the total players studied, or 4.2% of the boys injured. Neck injuries numbered 118, accounting for 0.6% of the players, or 2.4% of injured players. Combined head and neck injuries totaled 16 or 0.3% of those injured. Of the total 337 cases, 182 were studied intensively.¹

Head Injury Case Study

Twenty-four percent of the players in the head injury case study were injured by a blow from the opponent's knee or thigh. Tackling too low or lowering the head while tackling were the major causes of injury.²

A basic fundamental of football play was violated by the player at the time of the injury in at least 34.5% of the cases. Violations most frequently consisted of having the head down and the neck flexed at the time of contact, tackling at the knees or below, or other actions not consistent with the coaching of the individual on the proper way to play the game.³

The helmets of the injured players, in most of the cases, were less than two years old, and only a few were defective at the time of injury. In only 4.7% of

¹Ibid.

²Ibid., p. 119.

³Ibid.

the cases, however, were the helmets fitted according to the manufacturer's instructions. In these cases the fit was rated "excellent". An additional 19.6% of the fittings were considered "good". The remainder of the helmets were not properly fitted. Other than "excellent" are considered inadequate for proper protection of the head of the player.¹

Over sixty percent of the players receiving head injuries were coached to "spear". Spearing is a strongly condemned practice where the plastic encased head is used as a battering ram in either blocking or tackling. Thirty-eight percent of the blockers were coached to aim with the helmet and not to make contact while the remaining sixty-two percent were instructed to strike the body of the opponent with the head.²

Tackling produced the majority of injuries, carrying the ball was second, while blocking ranked third in the number of head injuries. In nine percent of the cases of head injury, the activity at the time of the injury was not known.

¹Ibid.

²Ibid.

Seventy-two percent of the head injury cases had less than seven days of pre-season conditioning before scrimmaging. No team conditioning exercises whatsoever were used in 5.6% of the head injury cases.¹

Neck Injuries

"Eighty-one percent of the players with neck injuries had less than seven days of team conditioning exercises before scrimmage."² In 10.2% of the neck injury cases, scrimmage was begun immediately without any group conditioning. Less than three minutes daily was spent in neck-strengthening exercises in 57.6% of the players injured, and only 34% spent more than four minutes in this activity every day.³

Fifty-six percent of the players with neck injuries violated a basic fundamental of football play at the time of their injury according to their coaches and frequently themselves. The head was down and the neck was flexed in 42.4% of the neck injury cases. The cause of neck injury in thirteen percent of the cases was unknown.⁴

¹Ibid.

²Ibid.

³Ibid.

⁴Ibid.

The head was struck in 13.6% of the injuries by a knee or thigh. Ten percent of the players receiving neck injuries were injured while striking head-to-head with their opponents.¹

As in the head injuries group, most of the neck injuries were received while tackling.²

Summary of the Study

"Of the 19,413 high school football players that were studied, the incidence of head and neck injuries were found to be 1.0% and 0.6% respectively."³ The widespread use of the double-bar face guard, and the hard-shell plastic helmet are significant in reducing head injuries. Factors producing 182 head and neck injuries included the practice of "spearing", inadequate physical conditioning, improper fitting of headgear, and violations of the fundamentals of football play. The vast majority of injuries to the neck occurred when the neck was flexed. The face-guard was found not to be a cause of neck injuries.

¹Ibid.

²Ibid., p. 120.

³Ibid., p. 118.

"Efforts to cause helmets to impinge on the posterior of the neck during hyperextension were unsuccessful when helmets were properly fitted."¹

Head and Neck Injuries
are not Increasing

Recent statements have been made that head and neck injuries are increasing in number. These cannot be confirmed by present available information.

Dr. Alley states, that, according to Dr. Floyd Eastwood, "Head and neck injuries have become responsible for a high proportion of deaths in football, but no data available indicates that head and neck injuries are increasing."²

In the study of head and neck injuries by Dr. Alley, the incidence of head and neck injuries in 19,413 high school football players was found to be 6.9% of all injuries, or 1.7% of the players studied.³

¹Ibid., p. 120.

²Ibid.

³Ibid., p. 118.

Dr. August Thorndike states,

Until such time as accurate statistical material concerning all sports and the number of regular participants is available, it will not be possible to ascertain the true incidence of injury per exposure in any one sport. A great need exists for an accurate tabulation on a national scale of all injuries resulting in disability.¹

¹August Thorndike, M.D., "Prevention of Injury in Athletics," Journal of the American Medical Association, CLXII, No. 7, (November 17, 1956), p. 1132.

CHAPTER III

CONCLUSIONS OF THE AMERICAN MEDICAL ASSOCIATION ON THE MEDICAL ASPECTS OF SPORTS

Dr. Thomas B. Quigley, Chairman of the Report on the National Conference of Head Protection for Athletes, during the Fourth American Medical Association Proceedings on the Medical Aspects of Sports, stated the following conclusions of that conference:

1. The hard-shelled plastic helmet currently in general use in football is superior to previously used models constructed of other substances.
2. The practice of "spearing" or using the plastic-encased head as a battering ram in either blocking or tackling is strongly condemned.
3. Proper conditioning of the athlete including the muscles of the neck is a significant factor in preventing neck and head injuries.
4. The face guard now commonly used at all levels of football provides valuable protection against injuries to the face and teeth.
5. Proper fitting of a reliably constructed helmet, kept in good condition, is without a question an important consideration in providing players with optimum protection.
6. Mouth or tooth guards . . . are an important new protection against face and perhaps some head injuries.
7. Continuing research on head protection in athletics is needed, particularly to determine

(a) the impact blow to the head that the player can absorb with impunity, and (b) the potential impact likely to be developed by blows to the head in the various forms of athletics.¹

It is interesting to note here that the conclusions of the Committee of the Medical Aspects of Sports is in total agreement with Dr. Alley's study of the 19,413 California football players in regard to the causes and prevention of head and neck injuries in football.

¹Thomas B. Quigley, M.D., "Report on the National Conference of Head Protection for Athletes," The American Medical Association Proceedings of the Fourth National Conference on the Medical Aspects of Sports, (November 25, 1962), p. 3.

CHAPTER IV

REDUCING INJURIES TO THE FACE

The teeth, jaw bone, nose, and facial area are very important parts of the head that are also subject to injury. These areas are often forgotten when a reference is made to the head.

The face bar and the guard for the teeth are significant in reducing injuries to the face. The face bar protects the teeth, lower jaw, nose and cheek bones of the face. The mouth guard has proven its worth in eliminating permanent damage to the teeth.

The Face Bar

Dr. Don H. Donoghue believes in the helmet face-guard. He also believes the helmet should not come free from the player's head when a pulling pressure is applied, and that the face guard is not a cause of neck and head injury, and it should not be removed from football head-gear. Dr. Donoghue also believes the helmet should fit snugly to the head of the player. He states:

My experience before the advent of the face bar was that I spent every Sunday during the football season patching up broken faces. This is not necessarily broken noses or knocked out teeth. More

specifically, fractured molar bones, fractures of the zygoma, fractures of the superior maxilla, fractures of the mandible, fractures of the frontal bone, to say nothing of the many lacerations which accompanied these.¹

Dr. Donoghue also believes in the face bar and states as follows:

I must disagree violently with Dr. Schneider's recommendation that the face bar be eliminated. I think one of the disadvantages of specialization is that one is too apt to concentrate on his own problem and not be entirely aware of others that may co-exist.²

Dr. Donoghue, in the following statement, also believes the helmet should not pop off:

I certainly cannot agree that it would be desirable to have the helmet pop off. You can envisage what might happen. The player is crashing into the melee and when he needs it the most his helmet pops off, not only leaving the face but also the head exposed. I think danger is much more unlikely if the helmet holds snugly with the head.³

Mouth and Teeth Protection

When the head and neck are mentioned many forget the mouth, teeth, and even the facial bones.

Loss of teeth, a major "occupational hazard" of contact sports, could be prevented if athletes wore

¹Don H. Donoghue, M.D., "Head Protection With Helmet," The Journal of Sports Medicine and Physical Fitness, IV, No. 1, (March 1964), p. 43.

²Ibid., p. 44.

³Ibid., p. 45.

mouth protection.¹ This is the conclusion of the joint committee of the American Association for Health, Physical Education, and Recreation and the American Dental Association.

The committee noted football led the list as having particular need for mouth protection because injuries in this area totaled half of all injuries incurred in football.²

Although several types of protectors for the teeth are available, the committee recommended the custom-made, individual fabricated protector as being the most satisfactory, because ". . . it fits well, is comfortable, and does not interfere with breathing and speaking."³

¹Bureau of Dental Health Education and Bureau of Economic Research and Statistics, "Evaluation of Mouth Protectors used by High School Football Players," The Journal of the American Dental Association, LXVIII, (March 1964), p. 430.

²Ibid.

³Ibid., p. 435.

CHAPTER V

NEEDED RESEARCH

Continuing research into the protective equipment of the football player is only one of the many needed methods for reducing injuries to the head and neck in football.

Electronic equipment has been successfully placed inside the football helmet. This was made possible by a telemetering system built by the Government Electronics Division of Admiral Corporation. The telemetering equipment will transmit information of impact to the helmet of a football player during practice and game situations.¹

Northwestern University's Dr. Stephen E. Reid is Chairman of the radio telemetry experiment. The equipment was first tested in the Pro Bowl Game in December, 1961.

The objectives of Dr. Reid's study were as follows:

1. Measure statistically reliable impact data to the football helmet;
2. Locate the blows on the helmet;
3. Determine the direction from which the blows come;

¹Stephen E. Reid, M.D., "Medical Telemetry in Sports," American Medical Association Proceeding of the Fifth National Conference on the Medical Aspects of Sports, (December 1, 1963), p. 22.

4. Obtain the frequency of various blows;
5. Study the feasibility of radio telemetry in electroencephalography and to correlate the forces of impact with electroencephalogram;
6. Develop design criteria for safer football helmets.¹

According to Dr. Reid, reports on football injuries have alarmed many parents and educators. The blame for these injuries has been aimed toward the parents, the boy, the game, the coach and even the officials and doctors. He supports this contention by the following statement:

When one considers the large number of participants in the game and realizes that in high school the average annual incident is only 1.55 fatalities per 100,000 players participating, these fatalities will be found to compare favorably to the rate involved in the natural hazards of youth. Annually youngsters lose their lives swimming, fishing, hunting, and in many other recreational pursuits. On the highway where the hazard is the greatest, the male mortality of youthful automobile drivers between the ages of fifteen and nineteen years is fifty-seven per 100,000 participants. Banning football should not be the solution to the problem.²

¹Ibid., p. 25.

²Ibid., p. 22.

CHAPTER VI

ATHLETIC INJURY PREVENTION PROGRAM

Dr. August Thorndike has stated that any program for the prevention of athletic injuries must begin with the "compulsory preseason physical examination of all competitors."¹

Dr. Owen B. Murphy, speaking to a group of physicians and coaches, states a good athletic program that provides good care for athletes must include:

1. A well-trained and educated coach.
 - a. A coach from the physical education area of study.
 - b. A complete understanding of anatomy, physiology, fatigue, and exercise.
 - c. Veteran in game experiences.
2. Adequate facilities for play.
 - a. All football fields should be smooth and grassy.
 - b. Under no circumstances should the facilities contain stones or ruts.
 - c. All obstructions should be a minimum of thirty feet (30') from all boundaries.

¹Thorndike, op. cit., p. 1126.

3. Proper playing equipment.
 - a. No hand-me-downs.
 - b. Protective equipment should be fitted properly, and inspected often.
 - c. The substitutes' equipment should be the same quality as the first teams'.
4. Proper training.
 - a. Make known the rules and standards for training.
 - b. Know the high relationship of injury and fatigue.
5. Dress an adequate number of reserve players.
 - a. This permits frequent substitutions and cuts down on injuries.
6. Secure qualified officials and medical supervision for all contests.¹

Recognizing Possible Brain Injury

Parents of participating football players, and particularly coaches, must be conscious of the signs and symptoms of possible brain injury. The failure of the parent or the coach in recognizing these characteristics of possible brain injury may cost a boy his life.

¹Owen B. Murphy, M.D., "Prevention, Care, and Follow-Up," Medical Aspects of Sports, (November 25, 1960), pp. 20-23.

Dr. James C. H. Simmons has placed head injuries into three main groups.

1. The largest group of head injuries of athletes who sustain head trauma sufficiently severe enough to render them momentarily unconscious or disoriented should be hospitalized. The patient should be questioned concerning headache, visual disturbances, and nausea.

2. Loss of consciousness momentarily and slow to clear mentally. This victim should have an X-ray and should not return to football participation for at least two weeks.

3. Remaining unconscious with depressed or compound skull fracture. Hospitalization of this player is obvious. The maintenance of a patient's airway is of absolute necessity and the patient must be kept off his back. Do not administer narcotics or sedatives, and keep the patient on his side.¹

A player with a brain concussion or suspected brain concussion should not be permitted to return to any game. The object is to improve the brain, not to injure it.²

Other Injury Prevention Factors

The beginning of the prevention of injury in sports must come with an understanding of what makes

¹James C. H. Simmons, M.D., "Care of Head and Neck Injuries," Medical Aspects of Sports, (November 27, 1960), pp. 24-26.

²Garland A. Gray, Medicine in Sports (Newsletter), III, No. 1, (February 1963), p. 3.

an injury in sports different from other injuries. The age and the degree of physical fitness of the injured person are very important factors.¹

The practical approach to injury prevention requires a knowledge of the techniques of sports. Knowledge of the rules and the surroundings with a detailed knowledge of anatomy and physiology are necessary.²

Most institutions have little or no problem in securing medical supervision for football contests. However, very few schools have doctors on the sidelines during the practice sessions.

It is obvious that much can be gained in reducing the incidence of athletic injuries by insisting on more adequate medical supervision of game and practice situations.

Changes in the rules and regulations of the game, better enforcement of existing rules, and better supervision are the keys to reducing athletic injuries.³

¹"Prevention of Sports Injuries," Journal of Sports Medicine, II, No. 4, (December 1962), p. 233.

²Ibid., p. 236.

³Thorndike, op. cit., p. 1126.

A 1964 article in the Medicine In Sports News-
letter further substantiates the findings of the many
articles and studies mentioned within this paper.

Football injuries in high school can be
blamed on either poor conditioning or poor
techniques. The injured athlete is either
tired, out of shape or doing something wrong.¹

A further source indicates that a minimum of three
to four weeks of training before the first game would
eliminate many injuries. Substitute frequently and give
the substitutes time to warm up.²

¹James C. H. Russel, M.D. "Special Problems in
High School Sports," Medicine in Sports (Newsletter),
IV, No. 1, (February 1964), p. 4.

²James C. H. Russel, M.D. "Report from the American
Medical Association National Conference on Sports Medicine,"
Medicine in Sports (Newsletter), IV, No. 1, (February, 1964),
p. 2.

CHAPTER VII

TRAINING AND DEVELOPMENT OF THE NECK

Research has recognized the need for programs to develop the neck muscles thus reducing the possibility of neck injuries.

Developing strength in the muscles of the neck is the job of training and conditioning. In this paper training and conditioning shall be defined as the processes that achieve or bring about the strengthening of the neck. Processes are defined as methods such as calisthenics, isometrics, and weight training.

Development of the neck, through training, is not an overnight accomplishment. Dr. C. Ward Crampton states, "Months and years are required to grow a tough head and a strong, tough neck to carry it."¹

Dr. Allan J. Ryan, in a more recent article, stated,

A year-round program of physical conditioning is advocated for those interested in athletics. This makes possible the achievement of high performance levels throughout an entire sports

¹C. Ward Crampton, M.D., Training for Championship Athletics, (New York: McGraw-Hill Book Co., Inc., 1939), p. 285.

season with protection, unattainable by any other means - against injury.¹

Dr. Crampton suggests one start developing the neck by carrying a one hundred pound weight on the head, or by standing on one's head.²

Isometric Exercises

Isometric exercises may be used on an individual basis or in groups of two or more. The following is an example of an individual isometric exercise.

No. 1. Place the heel of the right hand to the right side of the head. Push with the hand and resist the pushing force with the muscles of the neck. Hold this contraction for six seconds.

Do the same with the left hand to the left side of the head.

Interlace the fingers and place the hands behind the head. Pull the head forward with the hands for six seconds while the neck muscles resist.

¹Allan J. Ryan, M.D., "Preparation of the Athlete for Competition," The Medical Aspects of Sports, (December 1, 1963), p. 38.

²Crampton, op. cit., p. 285.

Place one hand on the forehead, push for six seconds resisting the push with the neck muscles.¹

Exercise No. 2 is an example of an isometric exercise that may be performed by two or more individuals.

No. 2. This exercise is very similar to the first exercise except it is executed with a partner. The exerciser assumes a position on his hands and knees. His partner stands in front of him and places the heels of both hands on the top of the exerciser's head. A resistance is offered to the neck by pushing the hands down, keeping the elbows locked and steadily increasing the pressure being applied to the neck. By interlacing the fingers and placing the exerciser's forehead in the palms of the hand, a pulling pressure can be applied to the neck. The exercise is continued by pushing with a hand from each side of the head as in the first exercise.²

Calisthenic Exercises

The Wrestler's Bridge. This exercise may be introduced by leaving the helmet on. After assuming a

¹Samuel Homola, "The Plastic Helmet and Head Injuries," Scholastic Coach, XXXIV, No. 7, (March 1965), p. 42.

²Ibid., p. 44.

position on the back, the knees flexed and the feet flat on the ground, arch the neck and back and rock the weight of the body up onto the top of the head. An advanced addition to this would be to pivot by pushing with the feet, to the left and then to the right while still in the bridged position.¹

Weight Training Exercises

The Bull Toss. "Fill a bag with sand, ten pounds, twenty pounds. Get down on your hands and knees. Have someone put the bag on your head. See how far you can toss it."²

Warning - this should be done often under supervision after the neck has gone through preliminary exercises.

The Head Harness. Secure a neck harness and attach a weight to it. Bend forward at the waist, placing the hands on the knees, raise and lower the head slowly.³

¹Carl E. Klafs and Daniel D. Arnheim, Modern Principles of Athletic Training, The C. F. Mosby Company, Saint Louis, 1963), p. 88.

²Crampton, op. cit., p. 285.

³Homola, op. cit., p. 43.

Avoid strenuous neck exercises before scrimmages and games. Plan these exercises after scrimmages or on days when body contact is not employed.¹

All Around Development

Any program preparing athletes for body contact should include various forms of running, wind sprints, dashes and runs of a mile or more in length. Such characteristics as speed, strength, endurance, flexibility, acclimation to climate, diet, rest, weight training, and calisthenics cannot be stressed enough. The head and neck should not require so much time for development that other joints, ligaments, tendons and tissues are neglected. All around development is a must if an athlete is to receive the benefits of football.

¹Ibid., p. 44.

CHAPTER VIII

SUMMARY

Theoretically, a thorough understanding of the causes of head and neck injuries in football will lead coaches, players, trainers, and others directly connected with football, to a program that will reduce the chance of these injuries occurring. A clearing house for recording the causes of football injuries on a nationwide basis is needed so a continuing flow of research information can be disseminated to manufacturers of protective equipment, coaches, and committees on the rules of the game, and other groups or individuals connected with the safety of the players.

The medical profession has recognized the need for educating the members of their profession in the care and prevention of athletic injuries. Therefore, they established the organization known as The Medical Aspects of Sports which is affiliated with the American Medical Association.

Football, in educational institutions, is an educational experience for the participants. Because

of this, everything that can be done must be done if football injuries, not only to the head and neck, but also to the knee and other joints, bones, muscles, nerves and tendons, are to be reduced significantly in severity and in the number of occurrences.

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