Modern Technology of NFL Helmets

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Abstract—NFL player safety has been a very discussed topic over the years, especially the need to further protect players against debilitating and life-threatening concussion. While no helmet can actually prevent a concussion, they are an important first physical line of defense, one that might be made more effective by new and “smart” technology.

I. INTRODUCTION

The role of helmets is to make the game safer, but that follows a fine line. Brain injury is the result of the brain shifting rapidly inside the skull due to an impact or a violent movement of the head. Helmets do not prevent that movement of the brain and likely never will. Researchers and helmet manufacturers search for materials and designs that will more effectively reduce the force of impact transferred to a player’s head. The first helmets offering full protection of the skull were made of leather and featured holes in the earflaps. The John T. Riddell Company of Chicago introduced the first plastic football helmet. In addition to being stronger than leather models, the plastic helmet proved to be more durable. Riddell’s earliest molded shells still serve as models for modern energy-absorbing helmets.

II. METHODS

The newest design contains an outer shell that is constructed of a tough plastic called polycarbonate alloy, which arrives at the manufacturing plant in pellet form. The pellets are loaded into an injection-molding machine, melted, and forced into a cavity the size of a football helmet. It takes approximately one minute to mold one shell. Next, a multi-drill fixture drills 14-15 holes into the mold, which takes approximately. Next, protective air liners are produced. Some liners contain special foams and energy-attenuating or elastic materials. Like air, these materials are designed to absorb kinetic energy of movement and decrease the impact of a blow to the head. To produce the special foams required for the liner, large sheets of foam are die-cut to size, then the vinyl encasement is die-cut to size. A piece of vinyl is loaded into a vacuum former. The pieces of the die-cut foam are put into the vinyl and thermoformed to make an airtight seal. Another layer of vinyl is placed on top of the thermoform, and the process is repeated. The jaw pads are designed to fit below the earlobe. Face masks and chin straps are then attached. The face masks are made out of steel wire and coated with plastic. The color finish is an injection molded in at the time the shell is constructed. At the end of the assembly line, each helmet is subjected to inspection to ensure that the standards have been met.

III. RESULTS

One recent test involved two independent labs that tested each of the 16 commercially available helmets for impacts similar to what would be felt by an NFL player in the open field. Eight locations on each helmet were tested using four speeds of impact. The results showed that all 16 helmets met or exceeded national standards to protect players against traumatic head injuries, and none performed worse than a reference group of helmets from the 1990s.

IV. DISCUSSION

A new helmet design that is being tested is a one-piece helmet/shoulder pad combination which may help to protect the entire torso, not just the head and neck. This product is still in the testing stages. Protective Sports Equipment has developed a polyurethane safety accessory that is designed to attach to the football helmet to reduce the impact that can cause concussions. The design and material used in the manufacture of the ProCap allows for the absorption of more shock from a collision. Initial tests of the polyurethane safety accessory have had inconclusive results. Significantly more testing and evaluation will be done before this product is accepted.

References