HANDLE DESIGN FOR OPTIMAL HAND FUNCTION

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Tubular Handles can negatively affect the contents of the carpal tunnel. Years of injuries from grasping handles for tools and machines can cause carpal tunnel syndrome, tendonitis and wrist joint injuries. The can cause inability to use a hand and resulted in the longer absences from work than injuries from falls, accidents or fires.[1]

Cylindrical, tubular and rectangular handles are rolled flat structures. They place the hand on a rolled flat surface where the ends of the middle and ring fingers overlap the index and small fingers. They are pulled along a series of lines that contact the end joint of the index finger, the middle bones of the middle and ring fingers and the end bone of the small finger. Cylinders are pulled diagonally in the hand toward the carpal tunnel (CT) area. Gripping in this manner tenses asymmetric muscle groups in the forearm.

Handles could work better if they do not place pressure on the CT and conform to the natural function or neutral hand position where the hand rests or dangles at the side of the body, the finger tips form a diagonal, the palm and fingers form a cup, the thumb rests between the index and middle fingers and the wrist is mildly extended. However, handles designed for the neutral position are pulled by diagonally oriented fingers into the valley between the thenar and hypothenar muscles where they can compress the median nerve and tendons exiting the CT.

Seven principles for handles that do not place pressure on the carpal tunnel and employ optimal hand position are presented. First, handles should align the ends of the fingers parallel to the horizontal crease and not diagonally. Second, handles should extend from the cupped fingers to meet the muscles at the base of the thumb on the radial side of the hand and extend further on the other or ulnar side to meet a portion of the small muscles. Third, handles should have a recess on the proximal side to prevent contacting or placing pressure on the carpal tunnel. Fourth, handle design should be based on hand measurements in a position of function. Fifth, handles should come in sizes. Sixth, handles should be placed on tools to maintain the wrist and elbow in neutral position. The seventh is handles should support the maximum area of the hand and absorb, but not direct, vibration to the carpal tunnel. These principles led to prototypes and patents for handles for gripping, pinching and squeezing[2,3,4] .

The poster will illustrate and explain the principles Bonsil handles. Research, with existing tools, is needed to substantiate claims made for the Bonsil handle.

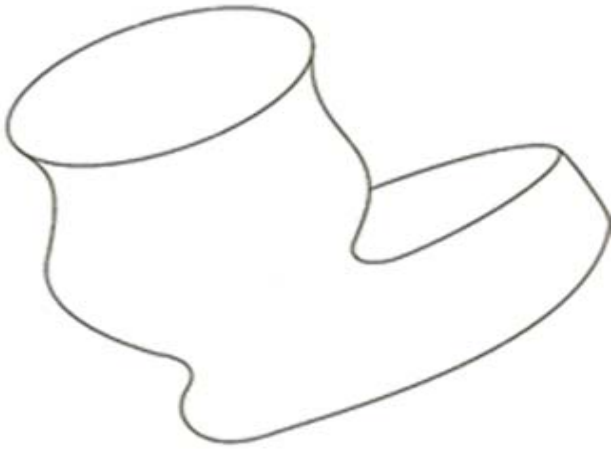

Figure 1

Figure 1 illustrates a large Bonsil handle. The upper section of handles for hammers will have a smaller radius than large power tools. Handles that support the upper body, such as crutches, canes and bicycles will have longer front to back lengths and shorter side to side lengths. The ulnar section extends further for supportive handles than for handles gripped like hammers.

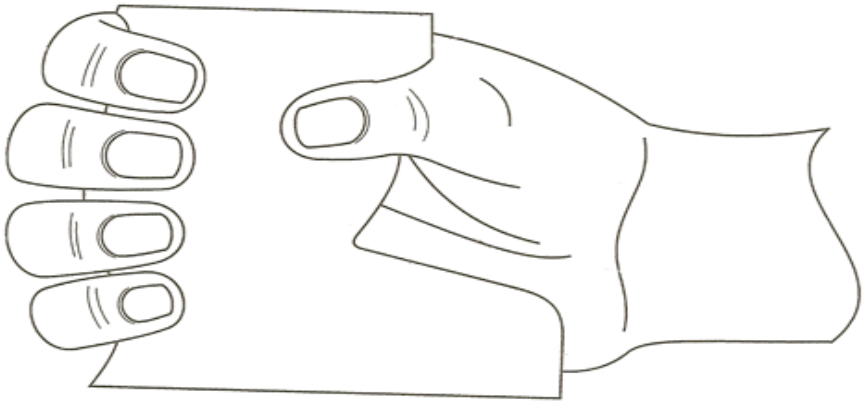

Figure 2

Figure 2 illustrates a hand wrapped around the Bonsil handle. Note, aligning the fingers preserves the cups formed by the fingers and palm. The thumb opposes the space between the index and middle fingers for strongest potential grip. The ulnar extension balances radial and ulnar grip. The CT area is not touched.

References

1. Repetitive Motion Results in Longest Work Absences. www.bls.gov.opub/ted/2004/mar/wk5/arto2.htm
2. US Patent 6,988,295 HANDLE/GRIP AND METHOD FOR DESIGNING THE LIKE
3. US Patent 6,944,914 HANDLE AND FORCEPS/TWEEZERS AND METHOD AND APPARATUS FOR DESIGNING THE LIKE
4. US Patent 7,010,835 PARALLEL HANDLE SYSTEM AND METHOD FOR DESIGNING A PARALLEL HANDLE SYSTEM