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DEVELOPMENT OF AN EXTREMITY LIFTING AND TRACTION DEVICE: ASSIST FOR PRE-OPERATIVE DISINFECTION

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Summary: Introduction:
Preoperative skin disinfection is a fundamental procedure performed to prevent infection. We intended to develop an assistant device that is able to lift the affected limb with additional traction assisting preoperative disinfection procedure. This study examined lifting and traction force using cadavers to establish basic data for the development of the disinfection assistant device.
Methods:
39 fresh cadavers (mean age: 79.0 ± 8.5) were used and only one leg for each cadaver was measured. Lifting and traction force were measured in supine position, while fixing the ankle of the cadaver to a handy scale using a strap. Lifting force was recorded when the foot was lifted 70 cm above from the table. Traction force was measured in 22 cadavers. Incision was made at the middle of the femur length minimizing damage to the surrounding tissue and the femur was fractured using an osteotome. The traction force was then recorded while lifting the foot 70 cm above from the table and applying traction on the leg at the same time trying to minimize any damage on the fractured area.
Results:
Before the fracture, lifting force was 3.8 ± 1.2 kg, and after the fracture, the traction force was 11.9 ± 3.9 kg. Lifting force was 6.7% of the average weight of cadavers, and traction force was 20.8% of the average weight. Regression analysis equations for lifting (Equation 1) and traction force (Equation 2) are as below. (x: body weight, y: force, unit: kg)

$$y = 0.0651x + 0.119 \quad (R2 = 0.7424) \qquad (1)$$
$$y = 0.1722x + 1.852 \quad (R2 = 0.5734) \qquad (2)$$

Discussion:
The disinfection assistant device, more efficient preoperative skin antisepsis is expected to be performed with one perioperative staff member, which currently involves at least two medical professionals. These test results from this study can be used to design an effective pre-operative disinfection assist device.