

## A pilot Study of Umbilical Cord Mini-Clamp

**Authors :** Seng Sing Tan

**Abstract :** Clamping of the umbilical cord after birth is widely practiced as a part of labor management. Further improvements were proposed to produce a smaller, lighter and more comfortable clamp while still maintaining current standards of clamping. A detachable holder was also developed to facilitate the clamping process. This pilot study on the efficacy of the mini-clamp was conducted to evaluate a tightness of the seal and a firm grip of the clamp on the umbilical cord. The study was carried out at National University Hospital, using 5 sets of placental cord. 18 samples of approximate 10 cm each were harvested. The test results showed that the mini-clamp was able to stop the flow through the cord after clamping without rupturing the cord. All slip tests passed with a load of 0.2 kg. In the pressure testing, 30kPa of saline was exerted into the umbilical veins. Although there was no physical sign of fluid leaking through the end secured by the mini-clamp, the results showed the pressure was not able to sustain the pressure set during the tests. 12 out of the 18 test samples have more than 7% of pressure drop in 30 seconds. During the pressure leak test, it was observed on several samples that when pressurized, small droplets of saline were growing on the outer surface of the cord lining membrane. It was thus hypothesized that the pressure drop was likely caused by the perfusion of the injected saline through the Wharton's jelly and the cord lining membrane. The average pressure in the umbilical vein is roughly 2.67kPa (20 mmHg), less than 10% of 30kPa (~225mmHg), set for the pressure testing. As such, the pressure set could be over-specified, leading to undesirable outcomes. The development of the mini-clamp was an attempt to increase the comfort of newly born babies while maintaining the usability and efficacy of hospital grade umbilical cord clamp. The pressure leak in this study would be unfair to fully attribute it to the design and efficacy of the mini-clamp. Considering the unexpected leakage of saline through the umbilical membrane due to over-specified pressure exerted on the umbilical veins, improvements can definitely be made to the existing experimental setup to obtain a more accurate and conclusive outcome. If proven conclusive and effective, the mini-clamp with a detachable holder could be a smaller and potentially cheaper alternative to existing umbilical cord clamps. In addition, future clinical trials could be conducted to determine the user-friendliness of the mini-clamp and evaluate its practicality in the clinical setting by labor ward clinicians. A further potential improvement could be proposed on the sustainability factor of the mini-clamp. A biodegradable clamp would revolutionise the industry in this increasingly environmentally sustainability world.

**Keywords :** leak test, mini-clamp, slip test, umbilical cord

**Conference Title :** ICMDDD 2021 : International Conference on Medical Device Development and Design

**Conference Location :** Singapore, Singapore

**Conference Dates :** September 09-10, 2021