Rapid IV fluid administration with high-flow three-way stopcock

Abstract:

Background: Initial fluid resuscitation is presumed to be important for treating shock in the resuscitation phase. However, little is known how quickly and easily a physician could perform a rapid infusion with a syringe.

Objectives: We hypothesised that using a high-flow three-way stopcock (HTS) makes initial fluid resuscitation faster and easier than using a normal-flow three-way stopcock (NTS).

Methods: This was a simulation study with a prospective, nonblinded randomised crossover design. Twenty physicians were randomly assigned into two groups. Each participant used six peripheral intravenous infusion circuits, three with the HTS and the others with the NTS, and three cannulae, 22, 20, and 18 gauge (G). The first group started with the HTS first, while the other started with the NTS first. They were asked to inject the fluid as quick as possible. We compared the time until the participants finished rapid infusions of 500 ml of 0.9% saline and the practitioner's effort.

Results: In infusion circuits attached with the 22G cannula, the mean difference using the HTS and the NTS (95% confidence interval) was 16.30 ml/min (7.65-24.94) ($p < 0.01$). In those attached with the 20G cannula, the mean difference (95% CI) was 23.47 (12.43-34.51) ($p < 0.01$). In those attached with the 18G cannula, the mean difference (95% CI) was 42.53 (28.68-56.38) ($p < 0.01$).

Conclusions: This study revealed that the push-and-pull technique using the HTS was faster, easier, and less tiresome than using the NTS, with a statistically significant difference. In the resuscitation phase, initial and faster infusion is important. If only a single physician or other staff member such as a nurse is attending or does not have accessibility to any other devices in such an environment where medical resources are scarce, performing the push-and-pull technique using the HTS could help a physician to perform fluid resuscitation faster. By setting up the HTS instead of the NTS from the beginning, we would be able to begin fluid resuscitation immediately while preparing other devices.

Reference:

Yamaguchi K, Doi T, Muguruma T, Nakajima K, Nakamura K, Abe T, Takeuchi I, Morimura N. A simulation study of high-flow versus normal-flow three-way stopcock for rapid fluid administration in emergency situations: A randomised crossover design. Aust Crit Care.

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Rapid IV fluid administration with high-flow three-way stopcock with push-and-pull technique was faster when compared to normal flow stopcock.