Nanosheets Found To Control Surgical Bleeding

An article recently published in the Journal of Vascular Surgery discusses the successful control of bleeding by closing a vena cava wound with nanosheets. The article and its findings are the result of joint research by the National Defense Medical College and Waseda University (Takeoka Lab, Graduate School of Advanced Science and Engineering).

Severe damage to the large vessels from multiple trauma or accidental complications in surgery can cause exsanguinating hemorrhage leading to death. Especially in the thin-walled vena cava abundant with blood, a tear in a small laceration soon widens, requiring a difficult and specialized vascular surgery technique to be fixed. In development are nano-adhesive plasters that can easily be applied to lacerated vessel walls with no adhesive, and succeeded in arresting massive bleeding from the inferior vena cava in rabbits.

A research group from the National Defense Medical College, in joint research with the Waseda University Graduate School of Advanced Science and Engineering, has developed nano-thickness sheets (1/100,000~1/10,000 mm) about the same thinness as cell membranes. These pellicle sheets are so-called "nanosheets" that can be perfectly attached, with no gaps, to the organ or tissue surfaces with no adhesive. By applying these nanosheets, massive hemorrhaging from thin-walled large vessels, such as the vena cava, can be arrested.

Because the nanosheets are transparent, control of the bleeding can be clearly seen in addition to being able to overlap multiple nanosheets when there is insufficient arrest of the bleeding. A 7 mm incision to a rabbit's inferior vena cava can be fatal, but by applying nanosheets to the bleeding area, a quick hemostasis was realized in all the rabbit's wounds (lungs, digestive tract and the brain's arachnoid membrane). It's possible that these nanosheets could replace complicated surgical techniques such as vascular suturing, and not only in surgical patients receiving major operations, but also in trauma victims with massive hemorrhage.

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