Flexions of the Popliteal Artery and the Outcomes of the Endovascular Procedures

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Recently a hinge point of the maximum bending stress on the popliteal artery was identified when the knee was in flexion. The hinge point was about 10 cm above the knee joint line. They concluded that it is important to consider the characteristics and position of the hinge point to avoid complications.
sion. With the development of endovascular procedures including stenting, the classic classification is not adequate to predict arterial flexions in a mobile artery which is subjected to movements. To solve this lack of information, dynamic classification of the popliteal artery was developed based on the discovery of the exact location of the hinge point.\(^2\) This dynamic classification divides the popliteal artery into 3 sectors: the hinge point, the pre-hinge point, and the post-hinge point mapping the location of flexions of the popliteal artery when the knee bends. Although stenting of the popliteal artery is not common, its use is increasing. Flexions of the popliteal artery challenge the outcome of endovascular procedures in this anatomical sector. Mechanical forces, movement repetition, and knee flexion for long periods of time can contribute to a device fracture with or without thrombosis post-trauma.\(^4\) The hinge point or maximum stress zone of the popliteal artery is created when the knee bends, and its angle increases with the degree of knee flexion. The number of flexions and the severity in angle increase are proportional to the increasing degree of knee bending.

The Need to Sync the Best Technology with the Best Anatomy for Landing

R&D efforts are focusing on design and materials with properties that make stents strong but more flexible to adapt to such an environment.\(^5\) However, we cannot avoid the fact that it is still a foreign body deployed in a mobile artery. The better combination for a successful endovascular procedure in the popliteal artery should include the use of the best device and the best dynamic anatomical information identifying the least mechanical force area. To know where the mechanical force will take place, techniques like side view in flexion\(^6\) or dynamic angiography\(^2\) can be useful.

Might the Culture Challenge the Outcomes of the Endovascular Procedure?

Finally, from a dynamic perspective, the more the knee bends, the more flexions the popliteal artery develops.\(^2\) It is very interesting that this work by Sato et al.\(^1\) was conducted in Japan. The degree to which culture affects the outcome of an endovascular procedure in the popliteal...
artery is unknown but still should be under consideration at the time to indicate and endovascular procedure.7) Generally, deep squatting posture, a position in which soles of the feet lie flat on the floor and the knees bend more than 100 degrees,7) is uncommon among European and Europe-derived cultures but more prevalent in Asian cultures.8) Those that are not culturally accustomed have difficulty maintaining such position, commonly dubbed as the “Asian squat.” Specifically, to the Japanese culture, there is a sitting posture known as "seiza (座敷)," in which the person kneels on the floor, tucks their legs beneath their thighs, and sits on the heels. Commonly, the Japanese sit in seiza position for culturally traditional settings such as tea ceremonies, martial arts performances, and religious ceremonies for Shintoism and Buddhism. We not only need to be aware of but also respect the culture of our patients. Squatting for religious, eating, meditating, and other cultural purposes is rarely considered or reported at the time of deciding between an open vs. endovascular procedure.7)

A Take-home Message

We must understand the total aspect of the patient when deciding whether they are a candidate for endovascular procedures, particularly when a device will be potentially implanted. This includes anatomy, the dynamic difficulties that a stent may introduce in a mobile artery, the cultural aspects that could challenge the outcome of the procedure, the lifestyle of the patient, and of course, the best device possible to confront such challenges. Using a dynamic classification could be very helpful.

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