The Graph Classification for the Venous System of the Lower Limbs

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Introduction

The Hemodynamic Venous Map(MEV) is a conceptual representation of the venous system. Paths/Cycles are easily detected by simple inspection.

The Graph Classification(GC) allows a rigorous definition of Paths. Cycles are classified too, adopting the same conceptual frame. Teupitz classification(which includes Parana) is almost a subset of GC.

Material/Methods

Starting from the Ecocolordoppler(ECD) of the venous system and from the **MEV**, it's possible to derive a computerised representation(**MEV-c**) using the **VNet Model**(1991-2009,Aquarius-s.r.l.). Almost 1000 MEV-c were automatically analysed, counting the % rate of each internal net structure.

Theory

An essential tool is the Compartment-Level-Graph(CLG), the sequence of segmental levels in a Path, the height(1-4 bottom-up) being the type of venous net. Perforators are inserted as vertical segments which link N1 to other nets. Arches link N1-to-N2 and are not drawn in the CLG, which shows Path structure in immediate graphic format.

GC for Paths

p2p	point-to-point paths
O-p2p	open p2p
I/O	input-to-output paths
ShO	open I/O
I-min	input-to-minimal net paths
min-O	minimal net-to-output paths
min-min	minimal-to-minimal paths
min-max	minimal-to-maximal paths
max-min	maximal-to-minimal paths
ShV	vicarious paths

Six classes of min-min Paths are recognised. Cycles are classified accordingly. The classification of mixed non elementary minmin is built on known elementary structures.

Validation of GC

It's accomplished

-comparing GC to previous Teupitz classification, evaluating analogies/differences. GC /Teupitz differ mainly in sub-types of type-II-closed-Shunts.

-checking the completeness. In GC there are no unclassifiable objects.

-checking the determinism of the procedure(unique item), i.e. partitioning the set of all possible structures.

Conclusions

GC has mainly these features:

-It links diagnostics to modern Graph Theory knowledge.

-It classifies mainly Paths, the structures really used to transport blood and to bypass obstacles to flow as thromboses,

compressions, surgical sutures.

-It underlines that Cycles are classifiable as Paths.