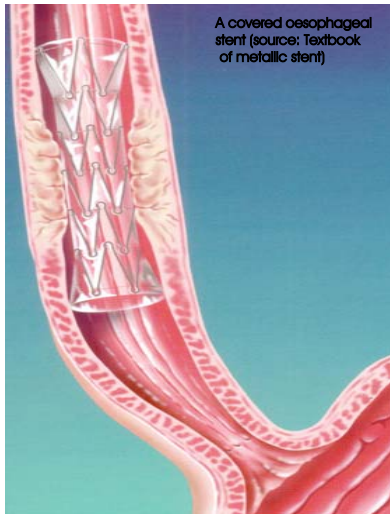


INNOVATIVE ORIGAMI EXPANDABLE STENTS

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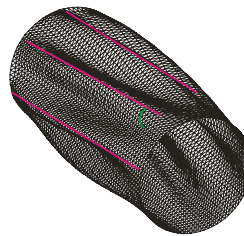
The work presented here concerns with covered stents or stent grafts.

Expandable stents are flexible tubular structures capable of being folded into small dimensions allowing their passage into the problematic locations in the body and then being expanded. Use of expandable stents has shown an important advance in the treatment of various diseases and stenting technique has been regarded as simple, safe and most effective in comparison with other non-surgical treatment.

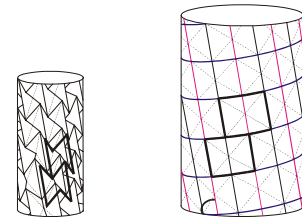
Although stents have been around for some time, most of the present expanding stents are made from *metal wire mesh* with or without cover. A typical covered stent or stent graft consists of a *membrane sleeve* attached around and supported by an expandable wire mesh backbone. In structural terms, the main difference between products produced by different companies is the design of the mesh wires.

Is it possible to merge the cover and mesh frame to form an integrated expandable cover (wall) without compromising foldability?

Due to the fact that most of the stents have tubular shape, we conducted a pilot study to investigate whether it is possible to fold a tubular stent. We first examined the buckling pattern of a thin-walled tube under torsion, which consists of a set of folds. This led us to believe that properly engineered folds, like origami patterns, could make folding of a tubular stent possible. As the result, a family of such patterns were found (*Kuribayashi and You, PCT/GB02/01424*).



Buckling pattern of a thin-walled tube under torsion.



A origami stent with helical folds when it is folded and fully expanded.



An origami stent made from stain-less steel. Its diameter expands from 12 mm to 23 mm.

The patterns are made from three types of folds: two sets of *helical* folds orthogonal to each other and *cross* folds. The existence of long helical folds enables a highly synchronised deployment process, produces flexibility allowing it to be bent and increases the circumferential strength of the structure considerably.

The *key features* of the origami stent concept are: -

- It is geometrically simple, and allows stents being made from any bio-compatible materials.
- It can be manufactured inexpensively.
- It is a generic solution and hence is able to be extended to fit the shape of particular sites.

We believe that the origami stent is an ideal replacement for the covered stents or stent grafts currently in use. We wish to jointly develop this concept further with an industry partner aiming to produce stents for clinical trials within two years.



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