

**TITLE:****WHAT EXACTLY IS MEANT BY 'LOSS OF DOMAIN' FOR  
VENTRAL HERNIA? A SURVEY OF 100 SURGEONS.****SHORT TITLE:****LOSS OF DOMAIN: A SURVEY OF SURGEONS.**

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This survey was carried out after we published a systematic review, which revealed that there was no standardised volumetric definition for loss of domain. We carried out this survey as

we wanted to deduce which volumetric definition for loss of domain was most intuitive to hernia surgeons.

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## **WHAT EXACTLY IS MEANT BY ‘LOSS OF DOMAIN’ FOR VENTRAL HERNIA? A SURVEY OF 100 SURGEONS.**

The term “loss of domain” (LOD) is used widely amongst surgeons to describe the relationship between ventral hernia (VH) volume and residual abdomino-pelvic cavity volume; hernias with significant LOD are difficult to repair and are more likely to recur [1]. However, the term appears loosely defined: A recent systematic review demonstrated considerable confusion, finding multiple different written and volumetric definitions [2]. For LOD to be a useful surgical concept, for example to predict post-operative recurrence, its definition should be standardised and applied consistently.

We performed a survey to gain deeper understanding of exactly what practicing surgeons understand by LOD. We hypothesised that LOD is poorly understood, without a consistent definition. We also aimed to determine if any single volumetric definition appeared more intuitive and appealing.

We designed a simple questionnaire to assess surgeons’ understanding of the phrase, ‘loss of domain’ (Online Document S1). A priori, we decided that a sample size of 100 would provide sufficient representative data. We collected respondents’ location, professional grade and sub-specialty, and whether they had an academic interest in abdominal wall reconstruction (AWR). Only surgeons performing VH repair routinely were asked to complete the questionnaire. We decided surgical residents were eligible, as we wished to assess which volumetric definition was most intuitive to them, in addition to consultants surgeons (attending surgeons).

We then asked respondents to annotate a schematic diagram of VH, to illustrate what ‘loss of domain of 25%’ meant to them. Subsequently, respondents were shown a second diagram that illustrated two volumetric definitions; the Sabbagh definition, i.e. hernia sac volume (HSV) divided by total peritoneal volume (TPV)[3], and; the Tanaka definition, i.e. HSV divided by abdominal cavity volume (ACV)[4]. Respondents indicated which definition appeared most intuitive. Lastly, respondents indicated their own personal threshold beyond which they believed it was difficult to close the abdominal cavity. Alternatively, respondents could select “nil cut-off”.

We conducted the survey February 2018 to January 2019. The questionnaire was distributed by researcher, SGP, to delegates attending two hernia conferences (AWR Europe, London, UK, February 2018 and Americas Hernia Society, Miami, USA, March 2018); to surgeons at three London hospitals; and adhoc to VH surgeons known to us. Responses were collated and descriptive statistics derived.

We achieved our sample of 100: 43 (43%) from conferences (18 London; 25 Miami), 52 (52%) from London Hospitals (28 UCL, 12 Princess Alexandra, 12 Chelsea and Westminster), and five (5%) from other hospitals (Online Table S1). Sixty (60%) worked in university hospitals, with 40 (40%) working in district general hospitals (DGHs). Sixty-seven (67%) were consultants (attendings); 33 (33%) residents. Surgical subspecialties varied with colorectal surgery most prevalent (35%) and hepatobiliary surgery least (1%). Twenty-nine (29%) respondents declared an academic interest in AWR.

Concerning ‘LOD of 25%’, 53 (53%) surgeons annotated the diagram with a hernia sac volume of 25% and a residual abdominopelvic cavity volume of 75% (Sabbagh [3]).

Eighteen (18%) respondents annotated the diagram with a hernia sac volume of 20% and a residual abdominopelvic cavity volume of 80% (Tanaka [4]). Twenty-one (21%) were unable to annotate the diagram, and 8 (8%) made miscellaneous annotations (Table 1). Of the 71 surgeons whose annotation designated either Sabbagh or Tanaka, 75% (53) indicated Sabbagh and 25% (18) Tanaka. All subgroups preferred Sabbagh to Tanaka except academic abdominal wall surgeons (Table 1).

Table 1: Question 1. Schematic diagram annotation.

When asked their preference between diagrammatic representations of Sabbagh [3] and Tanaka [4], 60 (60%) surgeons chose Sabbagh and 40 (40%) Tanaka. Again, the only subgroup exhibiting a preference for the Tanaka definition were academic AWR surgeons (Table 1).

Table 1: Question 2. Table showing the proportions of preferred volumetric method to describe loss of domain.

The most frequently chosen threshold value for significant LOD was 20%, selected by 35/100 surgeons. Thresholds of 25%, 30%, 15%, and 10% were selected by 26 (26%), 10 (10%), 5 (5%), and 3 (3%) respectively. Six surgeons documented other values. Sixty-three (63%) surgeons therefore selected a threshold value between 20 to 25% inclusive for clinically significant LOD. Fifteen surgeons selected “nil cut off”. While 20% was the most popular cut-point, at the time of completing the questionnaire, clinicians generally stated that their response was a “hunch” rather than evidence based.

For LOD to have clinical and prognostic utility, a generally accepted written and volumetric definition is required. In contrast, our survey confirms that the concept of LOD and its precise definition is poor amongst individual surgeons performing ventral hernia repair.

The annotation of a blank diagram was intended to discover surgeons' prior knowledge of LOD, and, if so, whether it was consistent. We found that many respondents understood the concept of LOD poorly; 21% could not annotate the diagram at all and a further 8% made miscellaneous/incomprehensible annotations. Of those offering recognised annotations, the majority favoured the Sabbagh concept, i.e. that a LOD of 25% means simply that 25% of the total peritoneal volume resides within the hernia sac. Interestingly, all of the subgroups we examined favoured Sabbagh over Tanaka with the sole exception of surgeons with an academic interest in AWR. The most plausible explanation is that the Tanaka definition has gained more traction within the academic community, possibly because the relevant publication preceded the Sabbagh method.

We then presented diagrams illustrating the Tanaka and Sabbagh methods and asked participants to offer a preference, which allowed participants previously unfamiliar with one or both methods to offer an opinion. Again, the group favoured the Sabbagh method overall, suggesting it is the more intuitive.

Our final question explored the threshold beyond which surgeons believe the risk of failed abdominal cavity closure (i.e. primary fascia closure) becomes clinically significant. It is claimed that LOD is a useful prognostic factor for recurrence [1] but, for this to be true, a threshold value should be identified and recognised.

In summary, our survey found that LOD is poorly understood. Overall, the Sabbagh method [3] is most intuitive and acceptable. Since LOD is a prime descriptor of hernia size and likely associated with operative and post-operative outcomes, a standardised and generally accepted definition is required.

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### **Conflict of interest statement:**

Windsor A.C.J. declares conflicts of interest not directly related to the submitted work; Consultant advisor for TELA BIO, educational grants and speaker for: BARD, LifeCell and Cook. Parker S.G, Halligan S, Erotocritou M, Plumb A.A, and Warren O.J declare no conflicts of interest.

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**Supporting information:**

1 x Online Document S1,

1 x Online Table S1