References

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Editorial Comment

Overview of paper

The Boston group is to be commended for their continued efforts to describe the biomechanics of penile erection. Unfortunately, this study fails to state what constitutes a “Functional Erection in an Individual Patient” since that would require knowledge not only of an individual’s erectile capability but also the anatomy, physiological condition and receptivity of the individual’s partner.

This report focuses on the linearity of radial rigidity values in excess of 60% relative to the linearity of axial buckling force values in excess of 1.5 kg. Most clinicians would characterize erections of this magnitude as unbuckleable, which raises the question: what is the clinical relevance of the linearity of a measurement system above the buckleable penile range?

Furthermore, axial buckling force measurements fail to record the ability of an individual to maintain an erection, another key parameter in assessing erectile capability. This renders them of dubious clinical value to practitioners evaluating or treating erectile disorders.

As the authors cited, previous investigators have confirmed the interpretation guidelines originally established for radial stiffness (rigidity) values as measured by the RigiScan system; namely, (a) a radial stiffness less than 30–40% corresponded to an erection inadequate for vaginal intromission, (b) above 60–70%, the penis becomes unbuckleable, and (c) the middle values provided enough rigidity so that vaginal intromission could be achieved with assistance. All clinicians have stressed the importance of interpreting the rigidity and tumescence data, whether acquired nocturnally or in response to other stimuli, in the context of the subject’s health profile and not as the sole determinant of that individual’s erectile capability.

Study design and practicality of methods

Patients were excluded from the study “If the pharmacocavernosometry study was incomplete, if

the patient had penile curvature precluding accurate axial buckling determination, if complete smooth muscle relaxation was unable to be achieved... or if erectile rigidity could not be generated or maintained despite... No mention is made of the numbers of patients who were excluded from the study nor is the etiology of any of the included or excluded patients described. Thus, to what subset of patients with erectile dysfunction do these measurements apply? Additionally, the criteria constituting “accurate axial buckling measurement” are not disclosed. Would the penile curvature have prevented these excluded subjects from having satisfactory intercourse? The RigiScan system can be applied to these patients as well as to any of the others excluded from this study.

Dynamic infusion studies to produce penile erections combined with axial buckling force measurements are unreliable, invasive and operator dependent, greatly limiting their practicality and reproducibility. This was confirmed in this report by the number (unreported) of excluded patients and with the requirement that a second observer be present during the measurement to assure that the load is applied parallel to the long axis of the penile shaft. RigiScan rigidity and tumescence studies can be conducted reliably, reproducibly and untended.

Repeated buckling measurements were performed in the study until consistency in the measured value was achieved. This further demonstrates the operator dependence and impractical nature of this measurement method.

No report of infusion rate was given. This would seem to be quite important in examining the ability of a thin-walled, pressurized, leaky vessel to resist buckling, and even more important when using the pressurized vessel as a controlled, characterizable model to compare two methods of assessing buckling resistance. The literature on the biomechanics of non-leaking, thin-walled structures is sparse; on leaky structures, non-existent.

Support for the authors’ assertion that the sensitivity of axial rigidity to penile geometric properties such as flaccid diameter and penile aspect ratio were based on observations from two of the subjects. The small data spread in these two

patients makes this assertion questionable. Nevertheless, radial rigidity values obtained from the RigiScan system were as sensitive as axial rigidity values to these two properties, contrary to the authors' interpretation.

This study reports the results of axial buckling force measurements versus RigiScan base loop radial rigidity for artificially induced erections using saline infusion. Saline infusion hydrostatically delivers an equally distributed pressure throughout the corporal bodies. Uniform distribution of corporal pressure in penile erections is at variance with clinical case reports that frequently exhibit differing base and tip rigidities, again calling into question the validity of the experimental model used by this investigative team. Furthermore, buckling of thin-walled, pressurized vessels occurs by localized collapse of the vessel wall (assuming the opposite wall does not rupture) when the radially directed wall force exceeds the inner vessel pressure on that wall segment. The RigiScan system measures this phenomenon at the base and tip of the penis; axial buckling force measurements, when they can be applied, give no indication of location of penile buckling which could be useful in assessing penile shaft abnormalities.

The authors draw out attention to the extreme sensitivity of axial buckling loads to increases in

intracavernosal pressure relative to radial rigidity values, particularly at the higher pressure values. Above a 1.5 kg axial load (Karacan's criterion) the individual has an erection satisfactory for intercourse, and increases in rigidity beyond this are cause for male bravado with little or no known diagnostic significance. Similarly, for radial rigidity above 60–70%, an individual had an unbuckleable penis and the sensitivity to increases in intracavernosal pressure is of unknown clinical value.

Conclusion and recommendation

This paper is very misleading to readers in that it attempts to discredit a very useful clinical tool by questioning its linearity (not its accuracy, or reliability, or usefulness) in a measurement range of unknown clinical significance. Until a reasonable hypothesis for the significance of intracorporal pressures above those required to achieve an unbuckleable erection is established, subjecting patients to the invasive application of supra-normal and potentially harmful infusion pressures is of questionable merit.

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