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LETTER TO THE EDITOR

Perforation of hollow viscera as a result of lithotripsy caused by shock waves: why does this occur?

Miguel Arrabal-Martin · Miguel Angel Arrabal-Polo · Armando Zuluaga-Gomez

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Dear editor,

Following a recent case of perforation of the ascending colon in our service after performing an extracorporeal lithotripsy due to shock waves, and in the light of the rare nature of this phenomenon in clinical practice (9 international cases published, including ours), we would like to clarify the physical and mechanical mechanisms that may give rise to this serious complication.

Extracorporeal lithotripsy by shock waves is performed thanks to an energy-producing system that forms the wave, which is applied to a focal point of the lithiasis, guided by radioscopy or ultrasound techniques. When intestinal gas and gas loops come between the point where the energy is produced and the focal point, this gives rise to an alteration in the acoustic impedance and in the transmission of the shock wave, initiating cavitation processes [1, 2] and a larger quantity of free waves that cause the injury. The high content in gas appears to facilitate the initiation of the cavitation process, due to the fact that they cause a larger number of bubbles at the focal point that interfere with the action of the pressure waves, due to the acoustic screening effect and the absorption of a large part of the energy that may lead to the rapid shifting of the bubbles and impact of the wave on the viscera in question. It has been verified that heterogeneous acoustic methods alter the transmission of the pressure wave and its efficacy, favouring lesions to the tissues [3]. The implosion that takes place on the bubbles causes pressure waves of up to 410 MPa that may either dissipate or have an impact on different viscera. When the pressure wave strikes a specific point repeatedly, the tissue tends to weaken and become devitalised, and starts to be eroded, which may lead to a crater-shaped lesion and subsequently, visceral perforation, in which the closer the air bubble is to the focal point, the greater the damage that is done. To prevent these tissue lesions and perforations, it is advisable to introduce systems for generating and applying the shock waves by means of a regulating device that blocks the transmission of the free pressure waves that are generated [4], and prevent gas from coming between the focus issuing the wave, convergent lens and focal point along the wave path. The high frequency of the shock wave reduces its efficacy and increases cavitation phenomena and therefore it is recommended that the shock waves be applied with a high amplitude and low frequency using a means with good acoustic transmission to prevent serious complications such as the perforation of hollow viscera [5].

As a further thought on the above, we should bear in mind that this type of complication is extremely rare but should not be ruled out, and so it is recommendable to take the necessary precautionary measures once the physical mechanisms that produce the injury are known, in order to control and reduce the iatrogenic effects of the shock waves (Table 1).

M. Arrabal-Martin · M. A. Arrabal-Polo (✉) · A. Zuluaga-Gomez
San Cecilio University Hospital, Camino de Ronda Street 143, 4º F, 18003 Granada, Spain
e-mail: arrabalp@ono.com

Table 1 Publicated cases in literature

Author	Age	Position	Viscera	Journal
Holmberg G	1997	Decubitus Prone	Small bowell	J Endourol
Geh JL	1997	Decubitus Prone	Small bowell	Br J Urol
Kurtz V	1999	Decubitus Prone	Small bowell	Chirurg
Olsson LE	2000	Decubitus Prone	Small bowell	J Urol
Lipay M	2000	Decubitus Prone	Colon Sigmoid	J Urol
Kajikawa T	2001	Decubitus Prone	Small bowell	Nippon Hiy
Klug R	2001	Decubitus Prone	Small bowell	Dig Surg
Rodrigues N Jr	2003	Decubitus Prone	Small bowell	J Endourol
Arrabal Polo M	2008	Decubitus Prone	Colon Ascending[a]	Actas Ur Esp
Kurz W	2009	Unknown	Colon Descending	Dtsch Med Wochenschr

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[a] Clinical note accepted for publish in Actas Urologicas Españolas. For publication

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