The British Journal of Radiology, *71* (1998), 241–243

Correspondence

(The Editors do not hold themselves responsible for opinions expressed by correspondents)
Correspondence

Rebound vasoconstriction of the small pulmonary arteries following short exposure to radiographic contrast media

The Editor—Sir,
We have recently reported the direct effects of radiographic contrast media (RCM) on the tension of isolated small pulmonary arteries (SPAs) (0.3–0.6 mm in diameter) using a Cambustion vessel myograph. The vessels were dissected out from male Wistar rats and mounted as a ring preparation bathed in physiological salt solution (PSS) gassed with 95% O_2 and 5% CO_2 [1]. From basal conditions exposure to RCM for 20 min caused biphasic changes in tension, a small transient fall (dilatation) followed by a sustained rise (constriction). The high osmolar diatrizoate was the most potent constrictor, the low osmolar ionic dimer ioxaglate was the most potent dilator and the iso-osmolar non-ionic dimer iotrolan was the least vasoactive [1].

We wish to report the changes in the tension of SPAs following a short exposure (2 min) to RCM. The bath solution was quickly replaced by PSS at the end of the 2 min. The vessels dilated during the exposure to diatrizoate (250 mgI ml^{-1}, $n=12$) but, when the bath solution was replaced by PSS, a vasoconstrictor response was observed with a peak value of 13.4 ± 1.1% K-Emax [%K-Emax = rise in tension caused by the tested drug ($mN\ mm^{-1}$) × 100/rise in tension caused by KCL 80 mM ($mN\ mm^{-1}$)]. The vasoconstriction lasted for 18.3 ± 1.9 min before a return to baseline tension. This rebound vasoconstriction following the removal of RCM was not observed with equi-iodine concentrations of the low osmolar RCM ioxaglate and iopromide and the iso-osmolar agent iotrolan ($n=12$/group). However, a vasodilatory response was observed during the exposure of SPAs to these agents.

The rebound vasoconstriction of SPAs generated by diatrizoate may be clinically important and explains why high osmolar RCM cause more changes in pulmonary haemodynamics than low-osmolar RCM. Reported fatalities following angiocardiography have been largely associated with high-osmolar RCM [2]. It is tempting to postulate that transient exposure of the small pulmonary arteries to high concentration of RCM during pulmonary angiography can be followed by a rebound sustained vasoconstriction which causes a rise in the pulmonary arterial pressure and haemodynamic alterations. Although the mechanism responsible for the rebound phenomena is not clear and needs further investigation, it seems to depend on hyperosmolality. A hyperosmolar dependent rebound vasoconstriction was also observed in the isolated perfused rat kidney experimental model [3]. A hyperosmolar solution of sodium iothalamate induced a vasodilatory response followed by a prolonged renal vasoconstriction on discontinuation of the iothalamate infusion [3]. No significant change in the real vascular resistance was observed when iothalamate was infused as an iso-osmotic solution. This work concluded that the high osmolality of iothalamate, rather than its chemical nature, was responsible for the initial renal vasodilatation and the rebound vasoconstriction [3].

Finally, the observation of rebound vasoconstriction of SPAs *in vitro* offers further support to the practice of using low osmolar in preference to high osmolar RCM in patients with pulmonary hypertension and right ventricular dysfunction, in order to avoid a significant rise in the pulmonary arterial pressure and serious circulatory disturbances.

Yours etc.,

[1]Y X Wang
[2]C Emery
[2]E Laude
[3]S K Morcos

[1]Department of Radiology
Rui Jin Hospital
Shanghai Second Medical University
Shanghai, Republic of China

[2]Department of Experimental Medicine
Sheffield University

[3]Department of Diagnostic Imaging
Northern General Hospital NHS Trust
Sheffield S5 7AU
(Received 15 October 1997 and accepted 20 October 1997)

References

1. Wang YX, Emery CJ, Laude E, Morcos SK. Effects of radiographic contrast media on the tension of isolated small pulmonary arteries. Br J Radiol 1997;70:1229–38.
2. Mills SR, Jackson BF, Older RA, Heaston DK, Moore AV. The incidence, aetiologies and avoidance of complications of pulmonary angiography in a large series. Radiology 1980;136:295–9.

3. Haylor JL, El Sayed AA, El Nahas AM, Morcos SK. The effect of sodium iothalamate on the vascular resistance of isolated perfused rat kidney. Br J Radiol 1991;64:50–4.

Transcolostomy hydrostatic reduction of intussusception

The Editor—Sir,
Intussusception is a common childhood emergency for which non-operative reduction is currently the treatment of choice. We describe an acute ileocolic intussusception in a patient with a temporary sigmoid colostomy for Hirschprung's disease. The intussusception was successfully reduced using a Foley catheter inserted into the stoma instead of the rectum.

A 5-month-old baby girl presented with a 1 day history of passing blood per rectum, vomiting and irritability. A sigmoid loop colostomy had been performed for Hirschprung's disease at the age of 1 month. Physical examination revealed an epigastric mass. An ultrasound scan of the abdomen showed a tubular mass in the mid-transverse colon with the "pseudokidney" sign on longitudinal sections and the "doughnut" sign on transverse sections, typical of intussusception (Figure 1). Ultrasound-guided hydrostatic reduction of the intussusception using Hartmann's solution was attempted through the colostomy. The patient had been prepared according to the standard protocol for this procedure, which included hydration, cross-matching of blood and sedation. With the patient lying supine, an 18 F Foley catheter was inserted into the colostomy located on the left abdominal wall. The balloon was gently inflated using 5 ml of air. Hartmann's solution was then introduced through the catheter under continuous ultrasound guidance, up to a maximum hydrostatic pressure of 100 mm Hg. The fluid was observed to surround the intussusception, which was gradually reduced through the ileo-caecal valve until complete disappearance of the mass and passage of free fluid through the oedematous valve (Figure 2). The intussusception was completely reduced in 2 min using a total of 150 ml of fluid. There was only minimal leakage of fluid from the stoma during the procedure. Multiple enlarged mesenteric lymph nodes were detected on ultrasound and were thought to be the predisposing cause of intussusception. An ultrasound scan 2 days later confirmed that there was no recurrence of the intussusception. She remained well at follow-up and subsequently underwent a Duhamel operation for her Hirschprung's disease.

Figure 1. Ultrasound of the epigastrum showing the typical "doughnut" sign (short arrows) of intussusception in the mid-transverse colon.

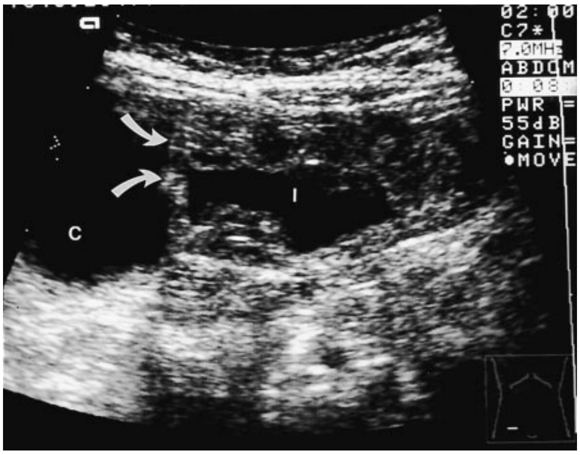

Figure 2. Ultrasound of the right iliac fossa following successful ultrasound-guided hydrostatic reduction of intussusception. Hartmann's solution is present in the caecum (C) and terminal ileum (I). The oedematous lips of the ileocaecal valve are arrowed.

Non-operative reduction of childhood intussusception is usually performed under fluoroscopic guidance, using barium or air [1]. At our institution, ultrasound-guided hydrostatic reduction of intussusception using Hartmann's solution is now the routine method of management of children presenting with this entity [2]. To our knowledge, this method of intussusception reduction has only been previously mentioned in one other patient [3]. This other case was also a child with Hirschprung's disease who had a diverting right transverse colostomy. A distal ileo-ileal intussuception was successfully reduced by proximal insertion of barium through the stoma [3]. In summary, transcolostomy hydrostatic reduction of intussusception should be considered as a therapeutic option in patients with colostomies.

Yours etc.,

[1]P L Khong
[1]W C G Peh
[2]W Cheng

Departments of [1]Diagnostic Radiology
and [2]Surgery
The University of Hong Kong
Queen Mary Hosptal
Hong Kong
(Received 13 October 1997 and accepted 22 October 1997)

References

1. Daneman A, Alton DJ. Intussuception: issues and controversies related to diagnosis and reduction. Radiol Clin North Am 1996;34:743–56.
2. Peh WCG, Khong PL, Lam C, Chan KL, Saing H, Cheng W, et al. Ileoileocolic intussusception in children: diagnosis and significance. Br J Radiol 1997;70:891–6.
3. West KW, Stephens B, Rescorla FJ, Vane DW, Grosfeld JL. Postoperative intussuception: experience with 36 cases in children. Surgery 1998;104:781–7.

Röntgen's other experiment—a further development

The Editor—Sir,

Since publication of my paper "Röntgen's other experiment" [1] describing the background to, and the significance of Röntgen's experiment to verify the existence of Maxwell's "displacement current", further research has revealed a facet of Röntgen's observations of far-reaching significance.

In the later half of the 19th century the preoccupation of many physicists with the "aether", that putative medium pervading the whole universe, had intensified. It was by now not just the "luminiferous aether" essential to carry visible light but, since Maxwell, was also the electromagnetic aether. Much ingenuity was expended in elaborating ideas about how it could have physical properties allowing it to carry high frequency electromagnetic vibrations and yet show no apparent resistance to the motions of the planets. However, the greatest problem with the concept lay in the fact that all astronomical and terrestrial experiments (of which the celebrated Michelson–Morley experiment is the most famous) had failed to show any movement through this aether of either the whole solar system or the earth itself. One group of theories developed to explain these puzzling (negative) observations, with which the names Fresnel, Hertz and Stokes are prominently associated, were based on the idea that the aether not only surrounds solid bodies but permeates them (necessary anyway for the conduction of electromagnetic radiation and other phenomena through them?) and is partially or totally carried along with them when they move ("convection" in the terminology of the time), thus eliminating any relative motion or "aether wind". This effect would have to apply to the whole earth and to Röntgen's moving dielectric discs. However, his results showed magnetic fields associated with the movement of the dielectric smaller than predicted on the basis of Stokes' theory. Indeed, it suggested, in the paradigm of the time, that when the dielectric moved it left behind the non-dielectric effects in the unmoved aether between the two capacitor plates. Later experiments by Eichenwald involving spinning both the dielectric disc and the capacitor plates yielded the larger effect independent of the dielectric material predicted by Stokes for movement of the dielectric alone. The interpretation was unequivocal; there is no "convection" of the aether.

This is what led Lorentz to dispense with all these ideas of aether "convection" and to wrestle anew with the problem of the missing "aether wind". This culminated in 1892 with his elaboration of a suggestion originally due to Fitzgerald that there is a contraction in the direction of movement of moving bodies (the Lorentz–Fitzgerald contraction). He extended these ideas to include the need for a "local time" for moving systems. The French mathematician Poincaré later reached similar conclusions couched in exactly the same mathematical form. All this was the essence of the Theory of Relativity. Einstein, as a matter of interest, contributed nothing more mathematically but, crucially, bought an entirely new philosophical approach to the issue. Indeed, in his celebrated work *A History of the Theories of Electricity and the Aether*, Edmund Whittaker boldly and controversially refers to the theory as "The Relativity Theory of Poincaré and Lorentz" [2]. As Max Born wrote of the theory of relativity "it was in the air by about 1900" [3].

Thus, Röntgen's brilliant experimental *tour de force* on the one hand may be seen as having placed a final brick into the structure of 19th century physics by demonstrating the validity of Maxwell's concept of the displacement current. On the other hand, by convincingly demonstrating that there is no "aether convection" phenomenon associated with moving bodies he forced a re-examination of the concepts of the aether and absolute and relative motion which culminated in the theory of relativity. Röntgen's experiment was one the significance of which it would be difficult to overstate.

Yours etc.,

P Dawson

Department of Diagnostic Imaging
Hammersmith Hospital
Du Cane Road
London
W12 0NN

(Received 15 November 1997 and accepted 3 December 1997)

References

1. Dawson P. Röntgen's other experiment. Br J Radiol 1997;70:809–16.
2. Whittaker E. (1954). A History of the Theories of the Aether and Electricity. II The Modern Theories. A History of Modern Physics 1800–1950, Volume 7. American Institute of Physics: Tomash Publishers, 1954:Ch. 2, 27–76.
3. Born M. Einstein's theory of relativity. New York: Dover Publications Inc., 1962.