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REPLY: We thank Drs. Carrio and Notivol, and associates, for their interest in our work. As we had noted in our original article, Notivol et al. found similar differences in gastric emptying rates between males and females, although they used a different technique (*1*).

We did not publish the phase of the menstrual cycle of our subjects because of human and animal data that indicate the phase of the cycle has little effect on gastrointestinal motility. Using a dual isotope radionuclide technique in humans, Horowitz et al. found no difference in the gastric emptying rate between the follicular and the luteal phases of the menstrual cycle (*2*). This lack of change in gastric emptying rates during the menstrual cycle also has been confirmed in animal studies. In rats, no change in gastrointestinal transit was found in cycling, compared to pregnant animals (*3*). These investigators felt the data indicated female sex hormones are responsible for slowing gastrointestinal transit but the absolute levels of the hormones were not important. Notivol and Carrio, et al. like Horowitz et al. found no difference between the follicular and luteal phases; however, Notivol stated they found a tendency for faster gastric emptying in the ovulatory phase (*1*). These investigators studied only 18 patients in various phases of their menstrual cycles, with only three patients in mid-cycle. In fact, in reviewing Figure 5 of Notivol's article, there is significant scatter in the gastric emptying T½'s that would make it difficult to come to any significant conclusions regarding the specific effect of ovulation. In addition, the authors did not confirm that ovulation or hormonal changes occurred mid-cycle. They merely assumed the 14th day equalled ovulation in their subjects. McDonald's study, which they quoted, was performed with an intubation technique and liquid meals only (*4*); therefore, we feel further study is necessary before concluding there is more rapid gastric emptying during the ovulatory phase. Finally, our study showed delayed gastric emptying in females; therefore, even if there were more rapid gastric emptying during ovulation, this in no way affects the results showing *delayed* gastric emptying in women compared to men.

The authors also ask if certain factors, such as time of day, were kept constant in our study group. They were. In fact, the article that Carrio and Notivol et al. reference on the effect of circadian rhythm on gastric emptying is from our group (*5*). Carrio and Notivol et al. mentioned further studies should be performed on "... the hormonal situation related to age ...". Indeed, we have studied this situation. In a study comparing 15 postmenopausal women to pre-menopausal women, we found premenopausal women, (normal sex hormone levels), had significantly slower gastric emptying than did post-menopausal women, (low or absent sex hormone level) (*6*). In fact, when the post-menopausal group was compared with a group of men, no statistically-significant difference in the rate of gastric emptying was found.

We disagree with Carrio and Notivol et al. concerning the shape of the liquid emptying curve. In numerous studies, we, as others, have found liquids empty in an exponential manner (*7–16*). Notivol et al. state they were able to fit only nine of 50 patients to a mono-exponential pattern; in the remainder, they found a better fit to a bi-phasic model. We think this is related to their technique. The authors performed their baseline data acquisition at 15 min after eating, and then obtained only three points at 30-min intervals. Curve fitting to this small number of data points would tend to straighten any curve. This is especially true since liquid T½'s are short (only 30.3 min for men and 53.8 min for women) (*17*). It is interesting to note Notivol and Carrio et al. did find exponential liquid emptying after 45 min (*1*).

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Captopril Renography in Goldblatt Hypertension

TO THE EDITOR: In a recently published paper (*1*) Nally and co-workers investigated the effect of angiotensin converting enzyme (ACE) inhibition in dogs with either two kidneys, one clip (2K1C) or one kidney, one clip (1K1C) hypertension. The aim of their study was to improve the sensitivity of renography for the noninvasive detection of renal artery stenosis (RAS). For technetium-99m diethylenetriaminepentaacetic acid ([^{99m}Tc]DTPA) as well as for iodine-131 iodohippurate ([^{131}I]OIH), captopril studies were found to be more sensitive in comparison to renography without ACE inhibition; however, RAS was most evident in the 15-min [^{99m}Tc] DTPA studies. For the assertion of RAS, time-activity curves from the kidneys were analyzed by integrating the area under the curve (integration period: first 5 min for 15-min [^{99m}Tc] DTPA and 30-min [^{131}I]OIH; initial 30 sec for 90-sec [^{99m}Tc] DTPA). The ratio of the areas under the curves (stenotic/contralateral kidney) was used to demonstrate the diagnostic effect of ACE inhibition.

From renography and from the effects of ACE inhibition in 2K1C hypertension, as well as from our own observation in patients with unilateral RAS we think this ratio inappropriate for RAS detection in captopril renography. It is generally accepted that the renogram A(t) can be described by the convolution integral of the arterial tracer concentration $c_a(t)$ and the impulse retention function R(t), multiplied by the renal extraction for the tracer. Therefore the renogram is given by the equation $A(t) = GFR \int c_a(t).\ R(t).d\tau$ for DTPA and $A(t) = ERPF.\int c_a(t).\ R(t).d\tau$ for OIH. ACE inhibition causes a rapid decrease in glomerular filtration rate (GFR) in RAS, but has little effect on the contralateral side (*1–3*). As a consequence in RAS with ACE inhibition [^{99m}Tc]DTPA uptake is diminished on the stenotic side, accompanied by a prolonged retention for the radiopharmaceutical in the kidney. Since the integration time of 5 min is long compared to minimal transit times for [^{99m}Tc]DTPA—especially in well-hydrated individuals—the area under the stenotic kidney curve should increase. On the other hand the diminished uptake reduces the integral value. Thus in calculating the area for the stenotic side in 15-min [^{99m}Tc]DTPA in this manner the effects interfere and the sensitivity for RAS detection is reduced. Another puzzling point is the finding of an ~50% reduction for the [^{131}I]OIH ratio after captopril. In RAS, ACE inhibition decreases selectively the efferent arteriolar resistance, causing a dissociation of the autoregulation of the kidney

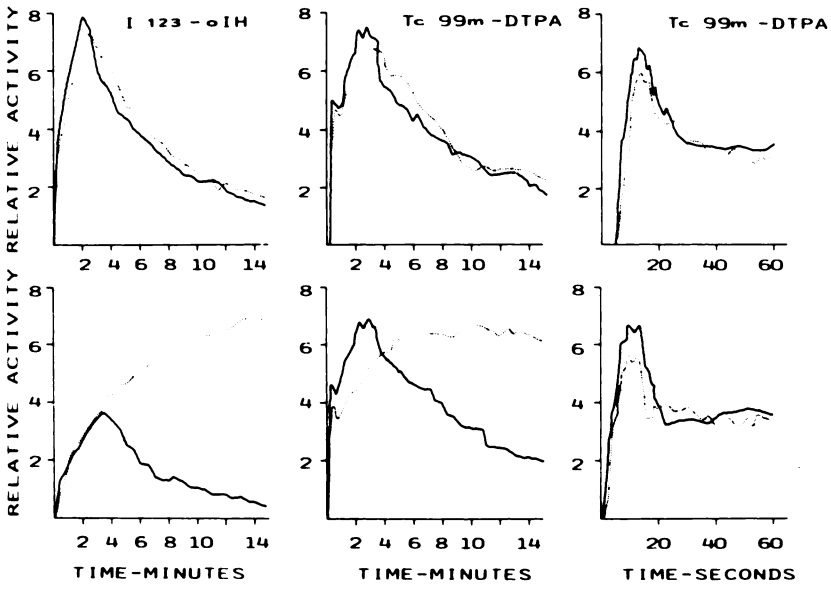

FIGURE 1
[^{123}I]OIH and [^{99m}Tc]DTPA renograms without captopril (upper row) and with captopril (lower row). A 70% stenosis of the right kidney (dotted line) was confirmed angiographically.