Erratum: Non-Newtonian effects in the peristaltic flow of a Maxwell fluid [Phys. Rev. E 64, 036303 (2001)]

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It has been called to our attention that a few typographical errors and some incomplete statements in the printed version of the paper escaped our scrutiny. In particular, the former Eq. (10) should be replaced by

$$-i\alpha(1-i\alpha t_m)P_1+\frac{1}{\mathrm{Re}}\left(V_1''+\frac{V_1'}{r}-\alpha^2V_1\right)+\frac{i\alpha}{3\mathrm{Re}}\left(U_1'+\frac{U_1}{r}+i\alpha V_1\right)=-i\alpha(1-i\alpha t_m)V_1,$$

i.e., there should be no prime on P_1.

The correct expression for $V_{20}(r)$ on page 3, in the middle of left column (not numbered) is

$$V_{20}(r)=D_2-\mathrm{Re}\int_r^1[V_1(\zeta)\bar{U}_1(\zeta)+\bar{V}_1(\zeta)U_1(\zeta)]d\zeta,$$

and so is for the former Eq. (16):

$$\langle Q\rangle=\pi\epsilon^2\left[D_2-\mathrm{Re}\int_0^1 r^2[V_1(r)\bar{U}_1(r)+\bar{V}_1(r)U_1(r)]dr\right].$$

The first paragraph of Sec. III should now read as: "In the previous section, we have shown that the inclusion of non-Newtonian effects into the classical peristaltic mechanism by using the Maxwell fluid model yields the following change: $\mathrm{Re}\to(1-i\alpha t_m)\mathrm{Re}$ in the first order solutions, but not the second order ones."

The figures and conclusions of the paper remain unchanged as they were obtained effectively using the correct, above-mentioned equations. However, it appears that a relatively coarse step in α in Figs. 2–4 has obscured some interesting oscillatory behavior of the $\langle Q\rangle$ solutions. Here in the new Figs. 2–4 (which are now numbered 1–3) we present results which were affected by the unfortunate coarse step in α.

It follows from these figures that in certain parameter regimes small variations of the tube radius cause negative values of the net flow $\langle Q\rangle$. Interestingly, this can have some significance for, e.g., biological fluid dynamics when a slight alteration of radius of a blood vessel (for example, due to changes of pressure) can result in a sudden switch to negative values of $\langle Q\rangle$, i.e., *backflow*!

D.T. would like to thank James M. Christian for pointing out the above-mentioned inconsistencies and preparing the new figures.

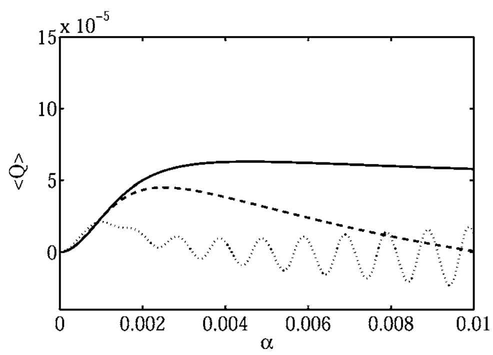

FIG. 1. Plot of dimensionless flow rate $\langle Q\rangle$ as a function of α. Here, $\epsilon=0.001$, $\mathrm{Re}=10000.00$, $\chi=0.6$. $t_m=0$ corresponds to the solid line, whereas $t_m=100.00$ and 1000.00 correspond to the dashed curve and dotted curve, respectively.

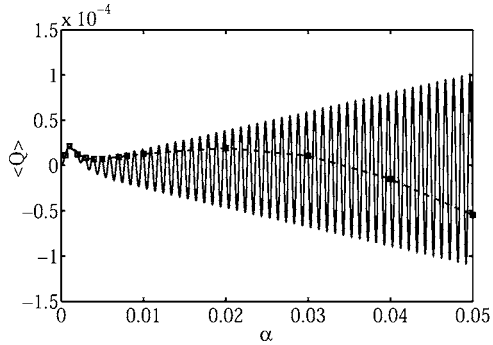

FIG. 2. Plot of dimensionless flow rate $\langle Q \rangle$ as a function of α over a larger interval than shown in Fig. 1. Here, $\epsilon=0.001$, Re $=10000.00$, $\chi=0.6$, $t_m=1000.00$. Dashed line with squares represents case of the old, coarse step in α, while the solid line is for the present, fine-α-step case.

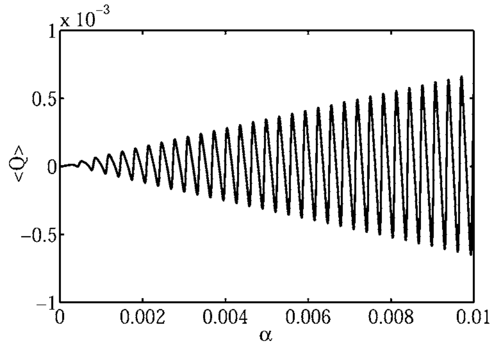

FIG. 3. Plot of dimensionless flow rate $\langle Q \rangle$ as a function of α. Here, $\epsilon=0.001$, Re$=10000.00$, $\chi=0.6$, $t_m=10000.00$.