EFFECTS OF PROSTAGLANDINS $F_{2\alpha}$ AND E_2 ON THE CONTRACTILITY OF NON-PREGNANT HUMAN FALLOPIAN TUBE *IN VITRO*

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Summary: The effects of $PGF_{2\alpha}$ and PGE_2 on the distal part of the isolated non-pregnant human fallopian tubes obtained from known menstrual phases has been investigated. Both $PGF_{2\alpha}$ and PGE_2 produced an increased contractility of fallopian tube. However, $PGF_{2\alpha}$ was found to be more potent than PGE_2 and also the contractions produced by the former compound showed wave forms of relatively high amplitude and low in frequency than that produced by the latter compound. These two compounds did not show a priming effect on each other. There was no discernible effect of phase of the menstrual cycle upon the contractile response to PG.

Key words: prostaglandin $F_{2\alpha}$ and E_2 contractility non-pregnant human fallopian tube

INTRODUCTION

The excitability produced by prostaglandin $F_2\alpha$ ($PGF_2\alpha$) on the myometrial and fallopian tubal musculature was undisputed, in human and animal studies conducted *in vivo* and *in vitro* (4,5,11). However, there were contradictory findings on the effect of the PGE series on the uterine and fallopian tube musculature. Early *in vitro* studies on non-pregnant human myometrium indicated that PGE series exerted an antagonistic effect to that produced by $PGF_2\alpha$ (1 2). However, later *in vitro* studies on pregnant and non-pregnant human myometrium showed increased contractility on exposure to PGE series (3,7,9). A few *in vivo* studies on both pregnant and non-pregnant human myometrium also showed spasmogenic effects produced by intravenous administration of PGE (6,8). Similarly, *in vitro* studies conducted on non-pregnant human fallopian tube showed excitatory effects at the proximal region and relaxation at the distal part due to PGE (9). In a later study, the same group demonstrated an increase in motility due to PGE, on the distal part of the non-pregnant human fallopian tube *in vitro*. However, there were no recent studies done to re-examine the reported contradictory findings on the effect of PGE on the distal part of the non-pregnant human fallopian tube obtained at known phases of the menstrual cycle. Therefore, the present investigation was conducted *in vitro*, as part of a continuous series of experiments to investigate the effect of PGE_2 as well as $PGF_2\alpha$ on the distal half of the non-pregnant human fallopian tube obtained at different phases of menstrual cycle.

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MATERIALS AND METHODS

Distal portions of non-pregnant human fallopian tubes were obtained from patients who had undergone surgery of the uterus due to varied reasons. Specimens from patients with lesions in the fallopian tubes were rejected. The menstrual phase of the patients were assessed by the history.

The specimens were immediately placed in Tyrode's solution (137 mM-NaCl, 2.7 mM-KCl, 1 mM-$MgCl_2$ 0.35 mM-$NaH_2PO_4.2H_2O$, 12 mM-$NaHCO_3$, 1.8 mM-$CaCl_2$, 5-mM-glucose). Thereafter a 2 cm X 5 mm piece of the intermediate and inner muscular tissue from the most distal end of the specimen was carefully dissected out. This preparation was mounted in a muscle chamber filled with 50 *ml* of Tyrode's solution at 37°C and allowed to stabilise while it was being bubbled with 5% CO_2 in O_2, so that pH was 7.3-7.4. Contractions of the strips were recorded isometrically with a 50 g strain gauge via an amplifier and pen recorder. Various concentrations of PGE_2 and $PGF_2\alpha$ were added separately and allowed to act only for a maximum period of 3 minutes. After each exposure, the muscle chamber was washed off twice with Tyrode's solution and allowed to stabilise again in fresh Tyrode's solution.

RESULTS

All the seven specimens in this series showed excitability due to $PGF_2\alpha$ as well as PGE_2 and 50 *ng/ml* and 100 *ng/ml* respectively were found to be the lowest concentrations required to initiate a change in the contractility (Table I).

TABLE I : Threshold concentrations of $PGF_{2\alpha}$ and PGE_2 to initiate a change in contractility in the distal part of the human fallopian tube at different phases of menstruation.

Specimen	*Day of the menstrual cycle*	*Lowest concentration of* $PGF_{2\alpha}$ *ng/ml*	*Lowest concentration of* E_2 *ng/ml*
1	5	50	100
2	14	100	100
3	26	75	200
4	7	100	300
5	7	75	200
6	20	75	200
7	22	100	200

Figure I shows the increase in rhythmic contraction of the fallopian tube when PGE_2 was added to the solution in different concentrations. The characteristics of excitation produced by PGE_2 is different from that produced by $PGF_2\alpha$. PGE_2 produced spasmogenic

effect with reduced amplitude whereas $PGF_{2}\alpha$ produced wave forms of low frequency with a higher amplitude (Fig. 1)

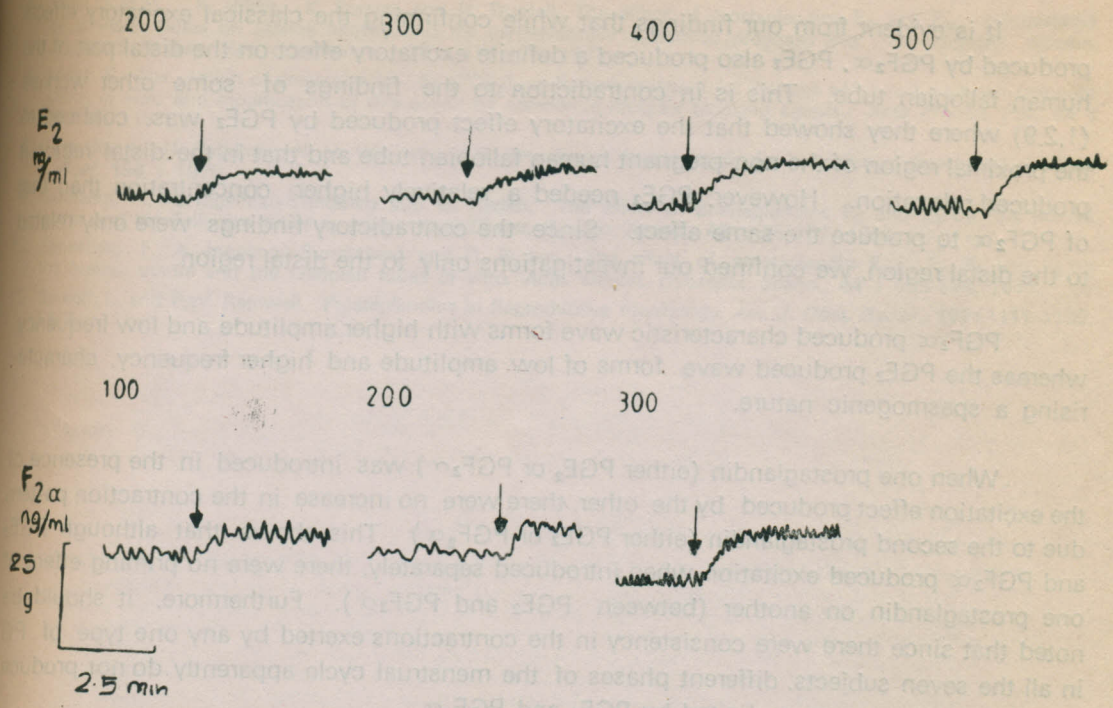

Fig. 1 : Comparison of the effect of PGE_2 and $PGF_{2\alpha}$ on the rhythmic contraction of the non-pregnant human fallopian tube (distal part).

In four specimens obtained from different subjects, when PGE_2 was added in the presence of $PGF_2\alpha$, there was no resultant increase in the excitation other than what was produced as a result of $PGF_2\alpha$ (Fig. 2). It was the same when $PGF_2\alpha$ was added in the presence of PGE_2.

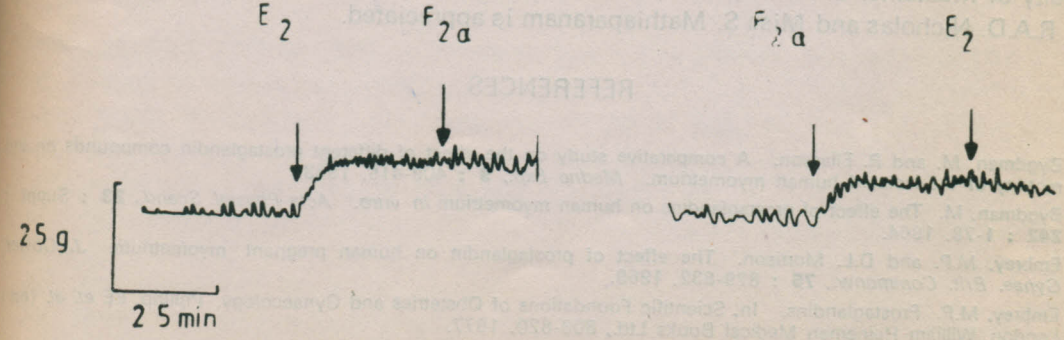

Fig. 2 : Rhythmic contraction of the isolated fallopian tube on exposure to $PGF_{2\alpha}$ (300 *ng/ml)* and PGE_2 (400 *ng/ml)* together.

DISCUSSION

It is evident from our findings that while confirming the classical excitatory effects produced by $PGF_2\alpha$, PGE_2 also produced a definite excitatory effect on the distal part of the human fallopian tube. This is in contradiction to the findings of some other workers (1,2,9) where they showed that the excitatory effect produced by PGE_2 was confined to the proximal region of the non-pregnant human fallopian tube and that in the distal region it produced relaxation. However, PGE_2 needed a relatively higher concentration than that of $PGF_2\alpha$ to produce the same effect. Since the contradictory findings were only related to the distal region, we confined our investigations only to the distal region.

$PGF_2\alpha$ produced characteristic wave forms with higher amplitude and low frequency, whereas the PGE_2 produced wave forms of low amplitude and higher frequency, characterising a spasmogenic nature.

When one prostaglandin (either PGE_2 or $PGF_2\alpha$) was introduced in the presence of the excitation effect produced by the other, there were no increase in the contraction pattern due to the second prostaglandin (either PGE_2 or $PGF_2\alpha$) This shows that although PGE_2 and $PGF_2\alpha$ produced excitation when introduced separately, there were no priming effect of one prostaglandin on another (between PGE_2 and $PGF_2\alpha$). Furthermore, it should be noted that since there were consistency in the contractions exerted by any one type of PG in all the seven subjects, different phases of the menstrual cycle apparently do not produce an effect on the response elicited by PGE_2 and $PGF_2\alpha$.

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