Lack of spontaneous ovarian contractions in the baboon

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Histological observations on the ovaries of various species reveal smooth muscle fibres throughout the stroma and theca interna (Lambertsen, Greenbaum, Wright & Wallach, 1976). Ovarian contractions have been observed and recorded in vitro and in vivo in an equally diverse number of species (Wright, Wallach, Fromm & Jeutter, 1976). Although the physiological significance of spontaneous ovarian contractions is not known it has been suggested that they may be in some way related to the mechanism of ovulation (Lipner & Maxwell, 1960). This speculation is supported by the observation that the frequency of spontaneous ovarian contractions increases about the time of ovulation (Virutamasen, Wright & Wallach, 1973).

The methods which have been used to monitor ovarian contractions in vivo are not capable of clearly delineating contractions of ovarian origin from ovarian movement resulting from contractions of the supporting mesenteries and ligaments of the ovary. Recent work in our laboratory has led to the development of very small doughnut-shaped carbon-impregnated silicone-rubber (Silastic S-2086, Dow Corning) transducers which are highly sensitive to direct contractile activity and relatively insensitive to movement. Instrumentation which provides for the biotelemetric transmission of the signal from these transducers permits their use in unrestrained, unanaesthetized animals for long periods of time. Moreover, because of the small size of the sensor (approximately 1200 μm in diameter), recording of contractile activity can be made at a precise location of interest without significant interference from movement of the structure being monitored. The method of making and calibrating the transducers and a description of the dual-channel biotelemetric system used for signal processing has been previously described (Blair & Beck, 1976; Blair, Gilliland & Sauer, 1976).

To test the question of whether or not ovarian tissues of the baboon (Papio papio) undergo spontaneous contractions, transducers of this type were positioned within the ovarian stroma of 3 adult baboons and observations were made on the contractile activity over a 30-day period. All 3 females were experiencing normal menstrual cycles. Two transducers were placed in each animal: one was positioned within the ovarian stroma and the other was placed in the peritoneal cavity immediately adjacent to the instrumented ovary. The transducers were attached to one another in tandem and thus the transducer outside the ovary served as a control for any interference resulting from animal movement or motility of the ovary resulting from contractions of its supporting structures.

A simple surgical method was used to position the transducers in the ovaries. The baboons were anaesthetized with halothane and the internal reproductive organs were exposed by a mid-ventral abdominal incision. After inspection of the ovaries the one selected for instrumentation was pierced with a 500 μm diameter piece of stainless-steel wire that was passed through the ovary to make a channel into which the first transducer was positioned. The transducer was drawn into the channel by a loop of 6-0 silk attached to the wire and passed through the lumen of the first transducer. After drawing the transducer midway into the ovary the silk was cut and pulled free from the ovary leaving the transducer in place. The reference transducer was left free in the peritoneal cavity immediately adjacent to the ovarian surface. The leads of the transducers were anchored to the broad ligament by a 6-0 silk suture and then passed through the musculature of the abdominal wall to a subcutaneous position where the biotelemetric pack, consisting of a battery-operated dual-channel transmitter, was implanted.

After recovery from surgery ovarian contractions were monitored for 1 h each day, 5 days a week over a 30-day period, i.e. the activity of both transducers was monitored simultaneously.
without disturbing the animal during 60 separate test periods of 60 min each. If activity occurred simultaneously at both stations during a test, it was discounted as possible artefact. The surgical procedure did not disturb the normal ovarian function of the baboons as evidenced by the continuance of normal cyclic changes in sex skin turgescence.

Results from a typical recording are shown in Text-fig. 1. In all 60 test periods there was a complete lack of spontaneous ovarian contractions measurable by this technique in the baboon. After completion of the experiment the transducer-telemetry systems were removed and the transducers were found to be still in position within the ovary; in one animal the transducers were still in place 5 months after insertion. Because the transducers were removed from the baboons without killing the animals or removing the ovaries there was no opportunity to study the ovary histologically to see how the ovarian tissues reacted to the transducer.

Text-fig. 1. Signals recorded from transducers in (a) the peritoneal cavity and (b) within the ovarian stroma of a baboon, showing the lack of spontaneous activity.

These observations lead to the conclusion that the baboon ovary does not undergo spontaneous muscular contractions of a type which cause changes in configuration of the stromal tissues at the site of the transducer implant. This negative result merits further investigation because it is contrary to the results reported in other species. The discrepancy may be due to the type of transducer used to measure and record ovarian contractions. Those used in our study are only slightly influenced by extraneous motility of the ovary resulting from contractions not of direct ovarian origin. Moreover, the use of a control transducer in our system provides a method for distinguishing artefacts in the recordings that result from animal movement or the movement of adjacent peritoneal structures. Larger transducers, especially those which are sensitive to changes in pressure, are more apt to respond to ovarian movement which may or may not be due to contractions of the ovary of a type which cause distortion of the ovarian mass.

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References


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