Mammary Souffle of Pregnancy
Report of Two Cases Simulating Patent Ductus Arteriosus

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Little attention has been paid to the continuous parasternal murmur that may occur during pregnancy and that disappears after lactation. We have encountered 2 cases of this phenomenon. The murmur probably arises from arteries supplying the breast. The mechanism of its production has not been established, but it may depend on some permanent anatomic anomaly. This benign murmur has special characters by which it may be readily distinguished from significant continuous murmurs.

SINCE Gibson's classical paper the "machinery" murmur has been recognized as the cardinal physical sign in the diagnosis of patent ductus arteriosus. Indeed, Muir and Brown described it, in its most typical form, as "the most pathognomonic of all murmurs." Owing largely to the stimulating effect of surgery upon diagnostic precision, however, there have been brought to light several other conditions producing continuous murmurs more or less similar in character. Conditions that produce such murmurs may be grouped as follows: 1. Patent ductus arteriosus. 2. Aorto-pulmonary septal defect. 3. Arteriovenous fistulas, whether congenital defects, secondary to acquired disease, or surgically constructed. 4. Dilated arteries, as in the collateral circulation in coarctation of the aorta, or that in pulmonary atresia. 5. Venous hums. Palmer and White frequently found these near the sternum in normal children. Venous hums in cirrhosis of the liver are sometimes confined to the midline of the chest and have occasionally been confused with the murmurs of congenital heart disease. 6. Anomalous drainage of a coronary artery into the right ventricle. Similarly, rupture of the sinus of Valsalva into the right ventricle may produce a continuous murmur. 7. Stenosed branch of the pulmonary artery with poststenotic dilatation or multiple stenoses of the branches of the pulmonary artery. Anomalous pulmonary venous return. Various other combinations of congenital defects, such as high ventricular septal defect and aortic or pulmonary valvular incompetence, in which something like a continuous murmur may be heard, the mechanism of production being more obscure. 10. The aortic arch syndrome, in which a continuous murmur may be heard, probably due either to a high pressure gradient along stenosed arteries, or to dilated collateral vessels. In Ross and McKusick's series the continuous murmur, heard in 5 cases, was in every instance supraclavicular. 11. Pregnancy. Innocent systolic murmurs, frequent at any time, are commonly heard all over the base of the heart in pregnancy; functional diastolic murmurs in pregnancy are mentioned by some writers. We have found few references to murmurs continuous in character during pregnancy and for this reason report the following cases.

Case Reports

Case 1. L.C., a 31-year-old Negro woman, was seen in the twenty-second week of her fifth pregnancy.

There was a past history of meningitis in childhood, latent syphilis treated with penicillin in 1950, and salpingitis in 1952. Of her 4 previous pregnancies, 2 had resulted in normal deliveries, 1 in a miscarriage, and 1 in a tubal pregnancy for which a salpingectomy was performed. There was no history of heart disease, and at all of her many previous physical examinations the heart had been described as normal. There was no family

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history of heart disease. The patient was now symptom-free, having in particular no dyspnea or other symptom referable to the cardiovascular system.

Examination showed a healthy-looking pregnant woman with the uterus enlarged to the level of the umbilicus. The pulse was regular at 88, and the blood pressure was 100/50 mm. Hg. The jugular venous pressure was not raised and there was no edema. The femoral pulses were easily palpable and not delayed. The apex beat was palpable 13 cm. from the midline in the fifth left intercostal space. No thrills were felt. The second pulmonary sound was accentuated but not widely split.

Localized to the second left interspace, close to the sternum, was a harsh "machinery" murmur heard continuously throughout systole and diastole. The murmur was not constant, but came and went with no relationship to posture, movement, or respiration. The effects of the Valsalva maneuver were not noted. Sometimes only the diastolic component was missing, and at other times the whole murmur was absent, in which case a soft systolic murmur of quite different character was heard in the second left interspace. It was noted, however, that the harsh continuous murmur was always abolished by firm pressure with the stethoscope.

General physical examination was otherwise negative. Chest x-ray showed an elevated diaphragm with a transverse heart and prominent pulmonary conus, normal for a pregnant woman. An electrocardiogram was normal. The hematocrit value was 36 per cent.

The patient was seen several times before and immediately after her normal delivery in December 1956, and on all but one occasion the continuous murmur was present. It was found to be variable in position, for while it was usually localized to the second left interspace, it was sometimes heard in the third left interspace or in corresponding situations on the right side. Disappearance of the murmur on pressure was invariably observed.

Two days after delivery a spectral phonocardiogram\(^2\) was taken through the courtesy of Dr. Victor McKusick (figs. 1, 2). In these records, frequency in cycles per second is on the vertical axis, time in seconds on the horizontal axis, and intensity at any given point in time and at a given frequency is indicated by grade of blackness in that part of the record.

The patient breast-fed her baby for 2 weeks only. She was again seen 4 months after delivery. The blood pressure was 120/75 mm. Hg, the apex beat was 9 cm. from the midline, the heart sounds were quite normal, and careful search revealed no trace of the murmur.

**Case 2.** N.C., was a Negro woman with no history of previous illness and no family history of congenital heart disease.

During her first pregnancy at the age of 13 the heart was described as normal. Her second pregnancy occurred in 1951 at the age of 16, and at the twenty-first week a cardiac murmur was first discovered. It was described on one occasion as heard all over the base of the heart, very loud, high pitched, systolic and diastolic in timing, and accompanied by a thrill in the second left interspace. On another occasion it was described as a systolic murmur over the second left interspace. An electrocardiogram was normal, and fluoroscopy showed elevation of the diaphragm due to pregnancy, with equivocal enlargement of the left atrium. The patient was considered to have congenital heart disease, probably patent ductus or atrial septal defect, and cardiac catheterization
was contemplated. After delivery, breast feeding was not attempted, and a month later no abnormality was found, there being only a soft apical systolic murmur. The patient remained symptom-free.

We saw her for the first time when she was 22 years old and in the twentieth week of her third pregnancy. Examination showed a healthy looking pregnant woman. The pulse was regular at 80, and the blood pressure was 110/70 mm. Hg. The jugular venous pressure was not raised, and there was no edema, or hepatic or splenic enlargement. The femoral pulses were palpable and not delayed. The heart was not enlarged clinically, and there were no thrills. The second pulmonary sound was slightly accentuated but not abnormally split.

In the second and third left and right spaces there was a loud harsh high-pitched murmur heard throughout systole and extending into the first half of diastole. The murmur varied in site from minute to minute, being sometimes best heard to the left of the sternum and sometimes to the right. The diastolic component was not constantly present, and the murmur was not heard continuously throughout systole and diastole (as it was in case 1) except when slight pressure was exerted with the stethoscope. Firm pressure abolished the murmur.

Movement of the head did not affect the murmur, but (again in contrast to case 1) the murmur was not audible when the patient sat up. This postural effect was not due to the exertion of sitting up, because the murmur remained absent no matter how long the patient remained sitting at rest. When she again lay down, the murmur reappeared after an interval of about half a minute.

A Valsalva maneuver was carried out several times, and the following events were noticed on each occasion: during the first 2 or 3 beats the murmur became progressively louder until it acquired a roaring character; after 4 or 5 more beats it declined in intensity, becoming softer than before the breath was held. Even when the murmur was at its loudest during this procedure, it was immediately abolished by firm pressure. Routine investigation revealed a negative serological test for syphilis and a hematocrit of 33%.

The patient was again seen at the twenty-fifth week of pregnancy, and the characters of the murmur were unchanged. A spectral phonocardiogram taken at that time is shown in figure 3. She was seen at 1 and 2 months after delivery. On both occasions the murmur was persistently absent.

DISCUSSION

Morgan Jones\textsuperscript{24} mentioned that loud, nasal extracardiac systolic murmurs, sometimes extending into diastole, may be heard in pregnancy; and that such murmurs have a very distinctive musical quality, and are heard at unusual sites and in unusual phases of the cardiac cycle. Gilston and McPhaul\textsuperscript{26} described 2 pregnant patients in whom both systolic and diastolic murmurs were present in the absence of recognizable organic disease.
This led them to examine a further group of healthy pregnant women in several of whom they encountered continuous murmurs (no numbers were given for these). Grant described 2 cases of pregnancy in which a systolic murmur continued into diastole and in the other a systolic murmur only, at first suggesting a diagnosis of patent ductus arteriosus. In these last 2 papers it was noted that such murmurs disappeared on pressure. Bonham Carter and Walker stated that a continuous murmur is not infrequently heard on auscultation of the lactating breast.

The following characters of the murmur are emphasized. It may occur throughout systole and diastole and its quality may closely simulate that of patent ductus arteriosus. The distinguishing properties of the sound are its variation in position from time to time, its evanescence, and its disappearance on firm pressure with the stethoscope. We found no way of bringing back the murmur when it was absent, and in neither of our cases was it affected by altering the position of the head or by the phase of respiration. The continuous character of the murmur was, in our second case, accentuated by light pressure with the stethoscope. Indeed, we have encountered another case in which a similar murmur, inaudible on routine auscultation, was produced by light, but not by firm, pressure. Such a murmur, however, would not be mistaken for that of patent ductus.

The onset of the murmur during pregnancy, its disappearance afterwards, and its abolition by firm pressure indicate that it arises from superficial vessels supplying the lactating breast. The failure of the Valsalva maneuver to abolish the murmur suggests an arterial rather than a venous origin. Such a view is further supported by the phonocardiograms which show that the maximum intensity is during systole; at times no diastolic component is recognized. In contrast, venous hums have a diastolic accentuation. The gap observed between the first heart sound and the commencement of the murmur is also characteristic of an arterial origin.

We have had no opportunity to study the behavior of the murmur during lactation, and whether the murmur disappears soon after delivery or only after all lactation has ceased. In Grant’s cases the murmur disappeared “soon after lactation began.” We do not know whether pregnancy produces this murmur by virtue of the associated increased blood flow through the breast, by engorgement of the breast with milk or blood, or by some other effect such as mechanical distortion of vessels by elevation of the diaphragm. Grant’s observations favor one of the latter two possibilities, because active hyperemia presumably persists throughout lactation. Since, however, the murmur is found in only a minority of pregnancies, and yet occurred in 2 successive pregnancies in our second case, there may be some further factor in its production, perhaps a latent structural anomaly in branches of the internal mammary arteries. The mechanism of production of this sound is comparable to that of the uterine souffle, and it seems appropriate to apply to it the analogous term “mammary souffle.” It is possible that the low hematocrit encountered in both cases is necessary for the production of the murmur, but it cannot be the main cause since such degrees of anemia are usually in pregnancy. As a test of this, we analyzed the routine hematocrit readings from a random sample of 50 colored women who were
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between the eighteenth and thirtieth weeks of their third and fourth pregnancies. These readings were taken from current case records of the Johns Hopkins Hospital. The following results were obtained.

Median 33.3 per cent
Range 27.5 to 39.0 per cent
Mean 33.6 per cent
Mean ± two standard deviations 28.3 to 39.0 per cent

In both of our patients, the hematocrit lay close to the above mean.

The resemblance on superficial examination between this murmur, when continuous, and that of patent ductus arteriosus may lead to diagnostic error, especially since there are further points of similarity in the hemodynamic effects of the two conditions—high pulse pressure, accentuation of the pulmonary second sound, and prominence of the pulmonary artery radiologically. The absence of symptoms is of little significance, since it is so characteristic in uncomplicated patent ductus as to be classed as one of its diagnostic criteria.2

Espino-Vela and Castro-Abreu,28 in a series of 53 cases of congenital heart disease in pregnant women, encountered patent ductus in 28 instances. Though it is clear from this and many other reports that the association of patent ductus and pregnancy is not rare, it is conceivable that some such cases have been misdiagnosed. The 2 murmurs are, however, readily distinguishable by the features mentioned. We are in no position to comment on the frequency of this phenomenon.

SUMMARY

The causes of continuous murmurs in the chest are listed. Two cases are reported of a continuous murmur occurring during pregnancy, disappearing after lactation, probably arising from superficial arteries supplying the lactating breast, and for that reason called a “mammary souffle.” Its quality may closely resemble that of the murmur of patent ductus arteriosus, from which it can be distinguished by its changeability in position, its evanescence, and its disappearance on firm pressure.

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SUMMARIO IN INTERLINGUA

Es presentate un lista del causas de murmures continue in le thorace. Es reportate duo casos de murmures continue que occurreva durante le pregnanti, dispareva post le fin del periodo de lactation, e eseva probablemente causate in arterias superficial que provisionava le mammas lactante. Pro iste ration, le termino “sufflo mammari” es usate pro illos. Le qualitate del sufflo potte esser multo simile al murmure de patente ducto arterioso, ab que illo es distinguibile per le variabilitate de su position, per su evanescencia, e per le facto que illo dispares sub forte pression.

REFERENCES


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