The Mammary Souffle of Pregnancy and Lactation

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In 1908 van den Bergh described a loud systolic murmur of unusual quality that appeared in a woman the day after parturition. It was localized to a small area in the second right intercostal space, and disappeared entirely when firm pressure with the stethoscope bell was applied over the site of maximum intensity. He believed the murmur was extracardiac, and owed its origin to enlarged tortuous branches of the internal mammary artery. In an extensive study of women during pregnancy and the puerperium he found 13 instances of such a murmur.

Fresh interest in the origin and mechanism of this extracardiac murmur has recently developed. Scott and Murphy introduced the term mammary souffle to describe the murmur, since they considered the mechanism similar to that of the uterine souffle.

We have recently encountered several examples of a mammary souffle in patients referred with such diagnoses as patent ductus arteriosus, aortic stenosis with regurgitation, and ventricular septal defect. The diagnostic difficulties created by these cases stimulated the following investigation into the incidence and clinical features of the mammary souffle.

Methods and Material

A total of 257 women were examined during pregnancy and the puerperium. The cases were distributed as follows: 19 patients in the first trimester of pregnancy, 28 patients in the second trimester, 45 patients in the third trimester, 165 patients in the first 2 weeks of the puerperium.

Phonocardiograms were recorded in 12 patients, with use of a Sanborn Twin-Beam Cardiette and electrocardiographic monitor. Logarithmic recordings were taken with a medium-sized open bell or a diaphragm chest piece, at paper speeds of 75 mm. per second with vertical timing markers at 0.04 and 0.20 second. The frequency response of this instrument reaches 500 cycles per second in the high-frequency range.

The response of the murmur to posture, respiration and the Valsalva maneuver was observed.

Results

Incidence

Twenty-five of 165 patients (15.3 per cent) examined in the postpartum period had a mammary souffle. The murmur was first heard between the second and tenth postpartum days in all instances, usually between the second and the fifth days. One patient who had given birth to a stillborn fetus showed the murmur on the second postpartum day. She was treated with stilbestrol and the murmur disappeared 2 days later. In patients who continued to lactate, the murmur remained audible for several weeks, and in 1 patient it persisted for 10 weeks after parturition. Parity did not influence the incidence of the murmur.

In the smaller series of patients examined during pregnancy the murmur was present in 6 of 45 cases in the third trimester (13.3 per cent), 5 of 28 in the second trimester (17.9 per cent), and in none in the first trimester.

Site

The murmur was maximal in the second right intercostal space in 9 patients, in the second left intercostal space in 14 patients, in the third left intercostal space in 4 patients, in the fourth left intercostal space in 3 patients, and in both second intercostal spaces in 6 patients. The murmur radiated poorly and was not heard in the neck or the back. Palpable arterial pulsation in the relevant intercostal spaces was noted in most cases.

Graphic Features

Examples of the murmur are illustrated in figure 1. The murmur was confined to systole...
in some instances (e.g., 1 and 5 in fig. 1). In the majority of cases, however, a short diastolic element was present as well (e.g., 3 and 4 in fig. 1). In some cases it continued through most of the cardiac cycle (e.g., 2 in fig. 1). In all instances an interval was present between the first heart sound and the commencement of the murmur, which extended up to or beyond the second heart sound. The vibrations responsible for the murmur were generally of very high frequency, so that it was often difficult to obtain satisfactory phonocardiographic records unless the murmur was loud.

The murmur could be obliterated either by direct compression with the stethoscope (fig. 2) or by firm pressure over the relevant intercostal space with the finger placed lateral to the stethoscope bell. It varied considerably in intensity not only from day to day, but in some instances from beat to beat. There was no clearcut relationship between engorgement of the breasts immediately prior to suckling and intensity of the murmur. It was always heard best with the patient lying flat, and sometimes disappeared completely when the patient sat up. Respiration had little effect on the murmur. The Valsalva maneuver diminished its intensity but did not effect its disappearance.

**Associated Heart Disease**

Six of the 36 patients with a mammary souffle had toxemia of pregnancy with hypertension. One other patient had severe puerperal megaloblastic anemia with dextrocardia and situs inversus; a continuous murmur was present in the second right intercostal space; compression obliterated this murmur, but a

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**Figure 1**

Phonocardiograms (1—5) of 5 patients illustrating the mammary souffle. Note: (a) delay in onset of the systolic murmur, (b), high-frequency vibrations of the systolic murmur, (c) continuous murmur in tracing 2, (d) spill-over into early diastole in tracings 3 and 4. 1, first heart sound; 2, second heart sound; S.M., systolic murmur; D.M., diastolic murmur; A, aortic component of second heart sound; P, pulmonary component of second heart sound.
MAMMARY SOUFFLE

Figure 2
A. Phonocardiogram (continuous strip) recorded in the fourth left intercostal space, showing high-frequency late systolic murmur that disappeared after compression with the stethoscope bell (arrow in strip A1). The murmur reappears after release of compression (arrow in strip A3). B. Recorded 50 seconds after A, showing return of the murmur to its previous intensity.

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midsystolic ejection type murmur of moderate intensity persisted. No patient was encountered with rheumatic valvular disease and a mammary souffle.

Four electrocardiograms were abnormal, showing left bundle-branch block, right bundle-branch block, atrioventricular block of the Wenckebach type, and the features of dextrocardia.

Of the 18 postpartum patients in whom chest radiography was performed, 10 were normal, 3 showed prominence of the pulmonary artery segment, and 5 were found to have a cardiothoracic ratio ranging between 50 and 56 per cent. The apparent cardiomegaly could not be explained by elevation of the diaphragm. Three of these patients showed a normal cardiothoracic ratio 6 months after delivery.

Discussion

The differential diagnosis of the mammary souffle has been discussed in detail by Scott and Murphy.7 Patent ductus arteriosus is the most prevalent form of congenital heart disease encountered in pregnancy." It may be difficult to distinguish the continuous murmur
of this condition from the mammary souffle under circumstances where the circulatory effects of pregnancy, with high pulse pressure and apparent cardiomegaly, may be similar to those found in patent ductus arteriosus. Obliteration of the mammary souffle by compression should differentiate it from the murmur of patent ductus arteriosus as well as from the murmurs of combined aortic stenosis and insufficiency. The mammary souffle that is confined to systole is readily distinguished from the innocent ejection systolic murmur of pregnancy by its late systolic accentuation and its response to compression.

The exact mechanism of the souffle has not been established. Our observations are consistent with the view of Scott and Murphy, McKusick, and others\textsuperscript{1, 3, 5} that it is arterial in origin. Hurst, Staton, and Hubbard\textsuperscript{6} on the other hand, considered that the continuous murmur in one of their cases arose in the dilated superficial veins of the breast. The graphic features of the murmur, with high-frequency vibrations, delay in onset, and late systolic accentuation, are those of an arterial bruit. By contrast, the vibrations of a venous hum are coarse and of low frequency, and show an early diastolic accentuation. The possibility that the souffle originates in arterio-

![Figure 3](image)

**Figure 3**

Semi-diagrammatic representation of the arterial blood supply to the breast.

venous communications within the breast is considered unlikely, since the murmur is most frequently heard in the second intercostal spaces at some distance from the breast. Failure of the Valsalva maneuver to abolish the murmur and the presence of prominent arterial pulsations in the underlying intercostal spaces lend added support to the arterial origin of the murmur.

The breast has an abundant arterial blood supply, which is provided by the internal mammary artery, the aortic intercostal arteries, and the lateral thoracic artery\textsuperscript{11} (fig. 3). The degree of participation of these vessels varies greatly and is seldom symmetrical. The perforating branches of the internal mammary artery are the most important and constant of these arteries. The second, third, and fourth branches become greatly enlarged during lactation.\textsuperscript{12} Van den Bergh's view, therefore, that the mammary souffle arises in these enlarged tortuous vessels seems most acceptable, notwithstanding Jensen's statement in 1938 that such an explanation for the murmur is "justly consigned to oblivion."

As Hurst, Staton, and Hubbard\textsuperscript{6} point out, however, the obliteration by digital compression applied lateral to the site of the murmur is not adequately explained by the above hypothesis. Since the perforating arteries run in a lateral direction toward the breast, the murmur should disappear after medial rather than lateral compression.

This inconsistency may be explained by attributing a significant role in the genesis of the mammary souffle to the intercostal arteries. The aorta supplies anterior intercostal branches to the lower 10 intercostal spaces and occasionally to the second intercostal space as well. The first 2 intercostal spaces are supplied by the superior intercostal artery, a branch of the costocervical trunk of the subclavian (fig. 3). The anterior and collateral branches of these aortic intercostal arteries anastomose extensively with the anterior intercostal branches of the internal mammary artery. It is conceivable that during pregnancy and lactation considerable

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amounts of blood are diverted toward the breasts along the perforating branches of the mammary artery. Lesser amounts of blood may therefore flow along the anterior intercostal branches of the internal mammary artery. This could create a pressure gradient between the anterior branches of the aortic intercostal arteries (or the superior intercostal artery in the second intercostal space) and the anterior intercostal branches of the internal mammary artery (fig. 3). The mammary souffle may be the consequence of such an alteration in dynamics and could thus arise at the site of anastomosis between these two vessels. This could account for its localization to a restricted area, its lack of radiation, its disappearance on lateral compression in the corresponding intercostal space, and the frequent association of prominent intercostal pulsation.

Summary

Two hundred and fifty-seven consecutive South African Bantu women were examined during pregnancy and the puerperium in order to determine the incidence of the mammary souffle. It was found in 15.3 per cent of women examined in the postpartum period, 13.3 per cent in the third trimester of pregnancy, 17.9 per cent in the second trimester, and in none before the twelfth week of pregnancy.

The phonocardiographic features of the murmur are illustrated and evidence is presented to indicate that the murmur is arterial in origin.

It is suggested that the murmur may arise at the site of anastomosis between branches of the aortic intercostal arteries and branches of the internal mammary artery.

Summario in Interlingua

Esseva examinate 257 consecutive feminas bantu de Sud-Africa durante le pregnantia e le puerperio pro determinar le incidentia de sufflo mammari. Le sufflo esseva incontrate in 15,3 pro cento del feminas durante le periodo post parto, in 13,3 pro cento durante le tertia trimestre del pregnantia, in 17,9 pro cento durante le secunde trimestre, e in nulle ante le dece-secunde septimana del pregnantia.

Le charateristicas phonocardiographie del murmur es illustrate, e datos es presentate que indica que illo es de origine arterial.

Es formulate le hypothese que le murum prenses su origine in le sito de anastomoses inter brancas de arterias intercostal aorte e brancas del arteria interne mammari.

References

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