

公益財団法人 セコム科学技術振興財団
研究成果報告書

研究課題名

お母さんと胎児の常時見守りセンサシートの開発
～出産前から母子の安全安心に貢献する～

Development of a sheet-type sensor system for monitoring mother and fetus
～Contributing to the safety and security of mothers and children even before the birth～

研究期間

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Abstract

"Health and growth of the pregnant woman and her fetus" is the concern of the entire family and society, and it is the most essential safety and security.

However, as the fetus rotates in the womb, there is an approximately 20% risk that the umbilical cord will wrap around the neck (umbilical cord winding) risk. In addition, the health of the fetus is largely dependent on the health of the pregnant woman. During antenatal care, ultrasound echoes are used to diagnose the health of the fetus, especially its heartbeat and growth. However, due to the absolute shortage of gynecologists in society, the frequency of these examinations is "only one time per a week" just before giving birth and there is no other way to know the health of the fetus and the pregnant woman. As a result, there is always the risk of stillbirth or being born with a disability due to problems in the womb. Under these circumstances, it can be said that modern society does not sufficiently ensure the "safety and security of the mother and child before birth".

In this study, we have successfully developed sheet-type bio-signal monitoring system that can detect the fetal movement (the act of the fetus moving its legs and hands in the uterus) and the mental and physical health of the pregnant woman, by simply applying it to a pregnant woman's abdomen. Bio-signals related to the health of the fetus and the pregnant woman, whose changes in electric potential are order of micro-volt, is monitored for 24 hours. Real-time monitoring of mother and fetus can be checked via smartphone as a "health care sensor". It is designed to measure the fetal heartbeat, respiration, maternal status (heartbeat and placental status), and the heartbeat of a pregnant woman through the epidermis of her abdomen.

Throughout the year of preparatory research and the three years of full-scale research, the sheet-type sensor system shown above has been realized and used in many medical institutions to advance health care and medical initiatives for pregnant women. In addition to the maternal and fetal electrocardiograms, we have realized to measure the uterine electrocardiogram accurately to determine the signs of early placental abruption of the placenta in the normal position, which is associated with the risk of fetal serious disease. Furthermore, in collaboration with the Department of Gynecology, we conducted more than originally planned, including sleep measurements related to menopausal symptoms. We have succeeded in achieving medical coordination.

In actual medical practice, in close collaboration with pregnant women, nurses, midwives, and obstetricians, we have been able to conduct research and development on how to better use and display the information and to be more user-friendly.

We will continue to work on this activity in the future, starting with the development of the new product, and will continue to work on "safety and security for mothers and children even before delivery. Build a social infrastructure to "watch over and protect" the pregnant woman and relieve her anxiety before she gives birth. Through accurate assessment of the mother and child's condition, we aim to realize a more prosperous and secure society for the future.