Kurume University Hospital. Prenatal ultrasound scans were performed after 15 weeks of gestation at 1 month intervals. 239 neonates were admitted to the neonatal intensive care unit and echoencephalography was performed repeatedly after birth. A total of 6 neonates were diagnosed as having an intracranial abnormality detected by ultrasound examination during the prenatal period.

Results and Discussion

The 6 patients with intracranial abnormality involved hydrocephalus with neural tube defect (3), Dandy-Walker syndrome (1), holoprosencephaly (1) and arteriovenous malformation (AVM) of Galen (1). An accurate diagnosis was made prenatally in all except for the case of AVM of Galen, in which the diagnosis was confirmed only postnatally. This correct noninvasive diagnosis of AVM of Galen establishes the efficacy of both two-dimensional echoencephalography and of echocardiography, combined with pulsed Doppler observation. There have been no reports with respect to Doppler echocardiography on cerebral AVM. Our case of AVM of Galen revealed significant diastolic Doppler signal on the aortic arch, which suggests a presence of cerebral A-V fistula. In the 4 patients with hydrocephalus (the 3 patients with neural tube defect and the one with Dandy-Walker syndrome), V-P shunt operation was performed shortly after birth. The prognosis was very poor in 3 patients, with holoprosencephaly (1), AVM of Galen (1), and with hydrocephalus with neural tube defect (1). The prognosis is good in the patient with Dandy-Walker syndrome at 1 year and 6 months of age with now normal psychomotor development.

_Key words:_ Intracranial abnormality, Ultrasonography, Prenatal diagnosis, Management

Real-time Compound Scanning for Echoencephalography

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One-dimensional echoencephalography (A-mode) ultrasound imaging is improved by B-mode scanning methods for two-dimensional cross-sectional pictures of the brain. In 1963 we developed a manual mechanical compound scanning technique, which offered a so-called “Static two-dimensional echoencephalographic image.”

To improve cross-sectional echoencephalographic imaging, both mechanical scanning systems with pivoting transducers and multi-element scanning systems were developed with this equipment. Scanning was conducted through the anterior fontanelle.

The ultrasound beam of a real time compound may visualize more reflecting planes than a sector scanning technique. For two-dimensional echencephalographic imaging in newborns a
multi-element real-time compound scanner with dynamic focussing was applied. The goal was to get tomographic pictures of the brain in three dimensions.

**Method**

A 3 MHz transducer with an array of 102 mm consisting of 256 elements is placed on the skull. A switching matrix incorporated in the transducer assembly selects 49 different groups of 64-adjacent elements. Each group is four elements shifted in relation to the preceding one and produces a phased array image of 90°. Overlapping phased array images produce the compound effect. The reflected ultrasound beams can be focussed at elected distances from the probe.

**Results**

Results of cranial compound scanning with dynamic focussing of a normal brain, hydrocephalic ventricles and an extracranial haemorrhage are reported. An example of dynamic focussing is given. In Figure a at 2 cm focussing from the probe shows an indication of gyri, Figure b at 4 cm the septum pellucidum, IIIrd ventricle, IVth ventricle and cerebellum, Figure c at 6 cm shows a detailed picture of IVth ventricle and cerebellum.

Advantages of real-time compound scanning:

1) Brain structures may be examined in three dimensions.
2) Infants with closed fontanelles may be examined with 3 MHz.

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**Figure.** Sagittal tomography in a normal baby with dynamic focussing of the reflected ultrasound. (a) focussing at 2 cm, (b) focussing at 4 cm, (c) focussing at 6 cm (see text).