Journal of Cardiography 12: 553-558, 1982

Non-invasive diagnosis of isolated chylopericardium using precordial pericardial imaging after oral administration of ^{131}I-triolein: Report of a case

Yoshiki FUJISEKI
Tadahiko KATSURA
Masakatsu GOTO
Katsuyuki KAWANISHI*

Summary

Chylopericardium is a rare disease and affects both sexes equally from neonate to adult. Usually, there are abnormal connections between the pericardial cavity and thoracic lymphatic systems. These connections are detected by (1) recovery of orally administered Sudan III from pericardial fluid, (2) evidence of radioactivity in the pericardial fluid by paracentesis after oral administration of ^{131}I-labeled triolein, and (3) lymphangiography. However, these method are technically difficult and invasive, thus sometimes dangerous for children.

We employed precordial pericardial imaging after oral administration of ^{131}I-labeled triolein on a 9-year-old Japanese girl with isolated chylopericardium before and after surgery. Abnormal connections and the back-ward flow to the pulmonary lymphatics were demonstrated by this method. This is an easy, non-invasive, reliable and safe method for detecting the abnormal connections of pericardial and lymphatic systems in children with chylopericardium.

Key words

Chylopericardium ^{131}I-triolein Non-invasive diagnosis

Isolated chylopericardium is an anatomical and clinical entity characterized by chylous effusion only in the pericardial sac. It is necessary for the diagnosis to confirm that the pericardial cavity and thoracic lymphatic systems are directly connected.

Anatomic communications between the pericardial cavity and thoracic lymphatic systems can be established by various methods in adult cases[1~3]. These methods are, however,

滋賀医科大学 小児科
*同 放射線科
大津市瀬田月輪町 (〒520-21)

Departments of Pediatrics and *Radiology, Shiga University of Medical Science, Seta, Ohtsu 520-21

Presented at the 23rd Meeting of the Japanese Society of Cardiovascular Sound held in Kurume, October 8-10, 1981
Received for publication March 17, 1982

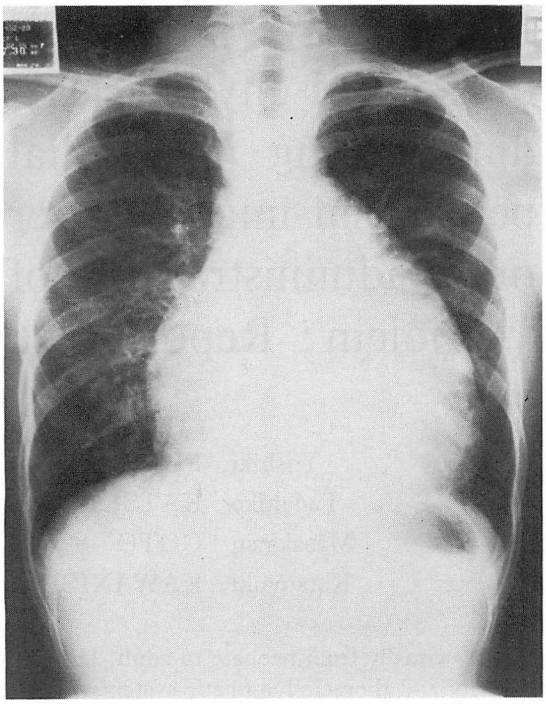

Fig. 1. Chest roentgenogram showing moderate cardiomegaly with water bottle configuration.

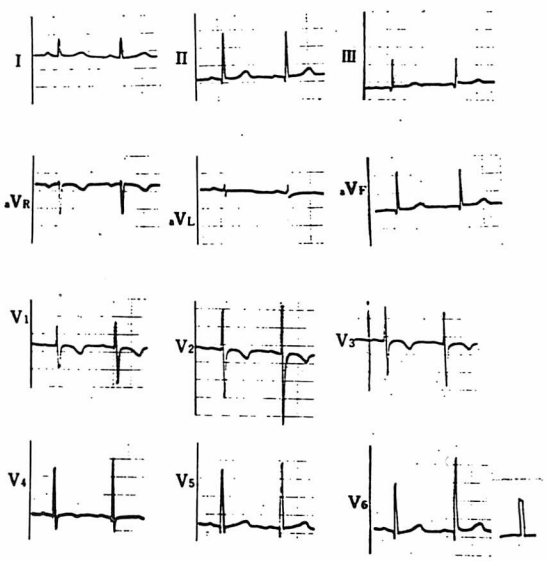

Fig. 2. Electrocardiogram showing normal sinus rhythm and electrical alternans on V1.

difficult, invasive, and not safe in children.

Recently, we employed radionuclide method in non-invasive diagnosis of chylopericardium using orally administered ^{131}I-triolein from the anterior chest wall. This is an easy, non-invasive, and safe method. The purpose of this report is to describe this non-invasive radionuclide method in the diagnosis of chylopericardium. Detailed presentation of this case was reported elsewhere,[4] and the diagnostic method is mainly described in the present communication.

Case Report

A 9-year-old Japanese girl was referred to our hospital for the evaluation of cardiomegaly (cardiothoracic ratio was 0.71, **Fig. 1**). The chest roentgenogram taken three years ago revealed no cardiomegaly (cardiothoracic ratio was 0.48). She had no significant symptoms.

Physical examination on admission revealed a well developed and well nourished girl. The pulse was regular at 100/min, and not paradoxical, the respiratory rate was 20/min, and blood pressure was 120/70 mmHg. The neck vein was not distended. The lungs were clear. The cardiac dullness enlarged to both right and left sides. Heart sounds were distant with a faint ejection systolic murmur which was best heard at the upper left sternal border. The second heart sound was normally split and the pulmonary component was of normal intensity. No liver was palpable, and there was no evidence of congestive heart failure.

The electrocardiogram (**Fig. 2**) was apparently normal. It showed mild electrical alternans on V_1. The chest roentgenogram demonstrated cardiomegaly of water bottle shape and normal pulmonary vasculature. The two-dimensional echocardiogram revealed massive pericardial effusion and pendular movement of the heart (**Fig. 3**).

Subxiphoid pericardiocentesis was performed. The fluid obtained was bloody and had 797mg/d*l* of triglyceride and 1.52 mEq/L of non-

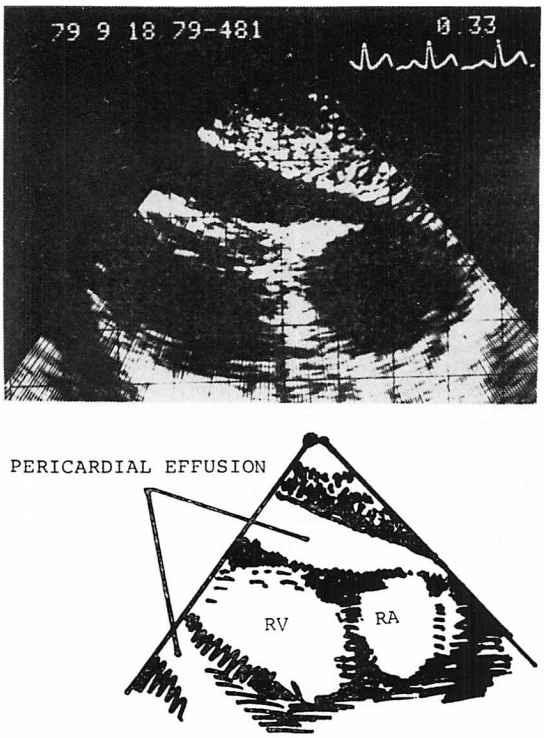

Fig. 3. Two-dimentional echocardiogram (subcostal view) **showing massive pericardial effusion.**

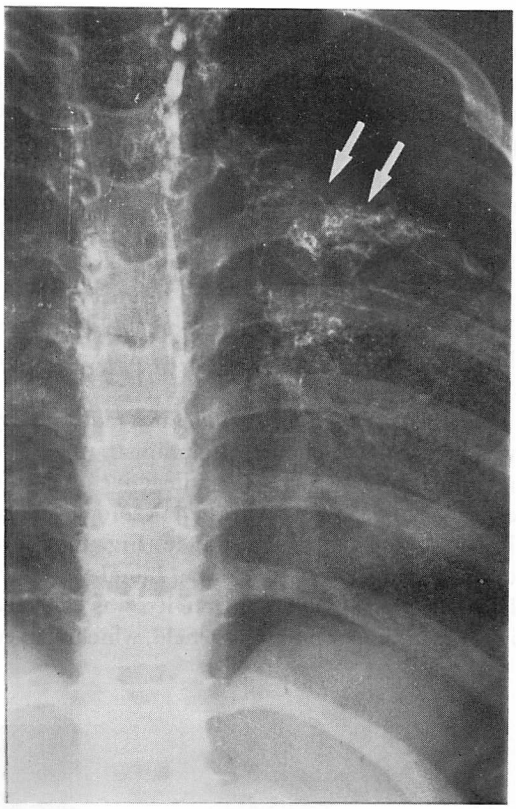

Fig. 4. Lymphangiogram.
Spongy proliferation of lymphatic vessels in the pericardium, and abnormal networks between thoracic ducts and the pericardial sac are noted. Arrows indicate abnormal networks.

esterified fatty acid (NEFA). The major part of the sediment was erythrocytes with some lymphocytes and mesothelial cells, but no atypical cells and malignant cells were seen. The punctata were separated into three layers after having been left standing for 24 hours. The upper layer had a milky white appearance, which was cleared by adding the equal volume of dietyl ether, thus suggesting that the aspirate is chylous fluid.

To evaluate abnormal communications between the pericardial cavity and lymphatic systems, we administered orally salad oil stained with Sudan III, and successfully recovered microscopically the fat droplets stained with Sudan III from pericardial fluid 24 hours later. Furthermore, we performed lower limb lymphangiography and serial films were taken from the limbs, pelvis, abdomen and chest. No abnormalities were found in the lower limbs and intra-abdominal lymphatic systems. The thoracic duct was opacified 50 min after the initial injection of contrast medium and two thoracic ducts were demonstrated above the diaphragm after 60 min. Outstanding proliferation of the lymphatic vessels was also found on the right upper part of the cardiac shadow, showing spongy appearance (**Fig. 4**). Contrast medium spread within the entire pericardial cavity 120 min after the initial injection. A small area of pooling of contrast medium was noted in the film taken 24 hours after the initial injection. This extravasation was located in the vicinity of the right main bronchus and communicated

with the posterior and upper part of the pericardial sac (**Fig. 5**).

To demonstrate the abnormal communications more accurately, we performed the external pericardial imaging after oral administration of ^{131}I-triolein. The patient was given the non-radioactive sodium iodide 2 days before the examination. Then, she was given 100 microcuries of ^{131}I-labeled triolein orally and imaged 24 and 48 hours later with Gamma Camera (Ohio-Nuclear Co. Sigma 410. Parallel Collimeter, high resolution type). The window was set at 140 KeV.

In the pericardium, moderate radioactivity was present at 24 hours of administration. The marginal zone was more radioactive than the central zone. The pericardial isotope image had a *doughnut* like appearance (**Fig. 6**). More dense pericardial activity was found 48 hours later (**Fig. 7**). Mild radioactivity was detected in the right upper pulmonary field, which seemed

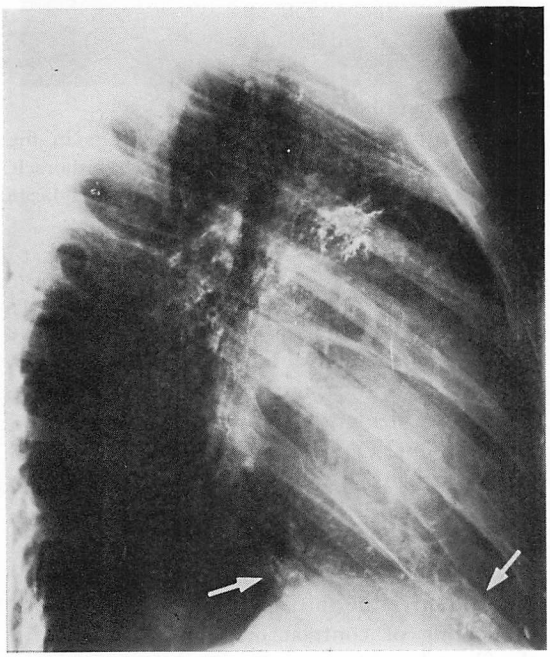

Fig. 5. Lymphangiogram.
Contrast medium (arrow) spreads over the pericardium 120 minutes later.

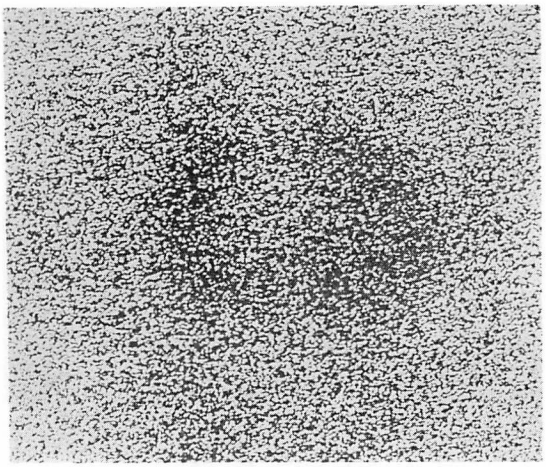

Fig. 6. Precordial pericardial imaging 24 hours after oral administration of ^{131}I-triolein showing " doughnut " like appearance.

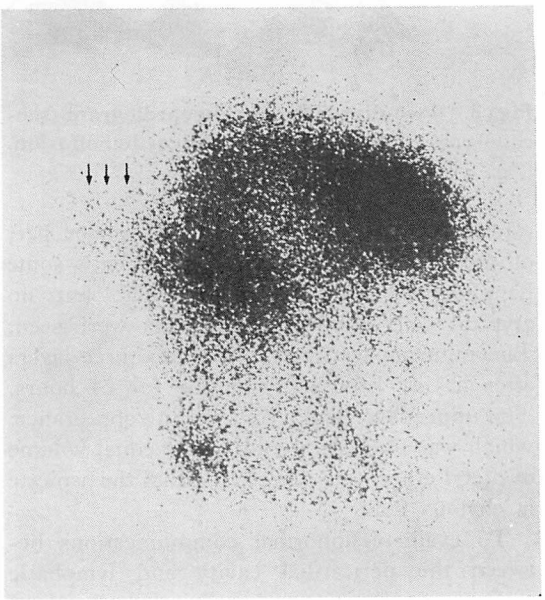

Fig. 7. Precordial pericardial imaging 48 hours after oral administration of ^{131}I-triolein.
Dence pericardial radioactivity is detected 48 hours later and mild radioactivity is observed in the right upper pulmonary field (indicated by arrows), which reveals a backward flow into the pulmonary lymphatics.

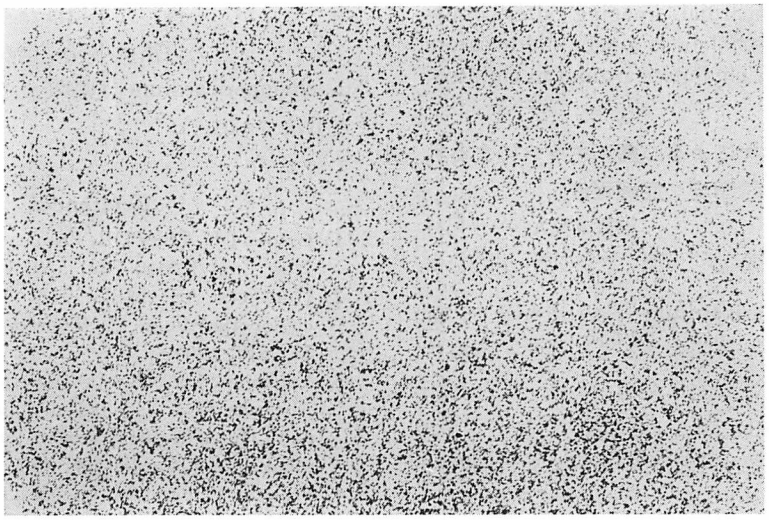

Fig. 8. Pracordial pericardial imaging three weeks after the surgery.
No definite precordial radioactivity is observed.

to indicate the back-ward flow of lymphatic fluid into pulmonary lymphatic vessels.

The thoracic duct was successfully ligated in the lower part of the thorax. The pericardial window was further created. Abnormal connections and spongy networks were confirmed to have been formed by lymphangioma. No precordial radioactivity after administration of oral ^{131}I-triolein was present three weeks after the operation (**Fig. 8**).

Discussion

Chylopericardium is caused by abnormal communications between the thoracic lymphatic systems and pericardial cavity. The connections are formed by such diverse cause as trauma, thoracic operation, neoplasma and congenital anomaly.

Groves and Effler[1] administered oil stained with Sudan III by mouth, followed by the pericardial tap of the fluid and the analysis for the presence of stained fat droplets. Miller and his associates[3] demonstrated abnormal connections and networks between the pericardial sac and thoracic duct by the lymphagiogram. Hudspeth and colleagues[2], however, failed to reveal such connections by the lymphangiogram. They administered oral triolein labeled with ^{131}I-subsequently accomplishing simultaneous measurement of radioactivity of chylous pericardial fluid and serum. Chylous fluid from the pericardial sac 24 hours later is more radioactive than serum.

However, these methods are not only inaccurate and invasive to children, but also carry some risk in case of pericardial paracentesis.

In 1975, Savran and his associates[5] administered triolein labeled with ^{131}I by mouth to their patients, and examined precordial radioactivity 6 and 24 hours later. At 6 hours, the scan was normal, but 24 hours later, dense precordial radioactivity was present, confirming the zone of the pericardial effusion.

Our case also demonstrated a *doughnut* like radionuclide uptake at 24 hours, and more dense radioactivity was found at 48 hours. And also demonstrated a back-ward flow into pulmonary lymphatic vessels.

Half life of ^{131}I-triolein is 8.06 days. Triolein is separated into glycerol and fatty acid by pancreatic juice and the bile, and re-synthetized to chylomicron in lymphatic systems. This radionuclide is not harmful to patients and commonly used in fat absorption test.

Precordial pericardial imaging after orally administered ^{131}I-triolein is a safe and accurate diagnostic tool for chylopericardium in children.

経口 ^{131}I-triolein による心嚢スキャンによる乳糜心嚢の非観血的診断法：症例報告

滋賀医科大学　小児科
藤関義樹，桂　忠彦，後藤正勝，川西克幸

Isolated chylopericardium はまれな疾患で，新生児期から成人までの報告がある．通常，胸線リンパ管系と心嚢腔との間に交通があり，これを証明することが診断上必要であった．

最近，我々は心拡大を主訴に来院した9歳の女児に ^{131}I-triolein 100 μCi を経口的に服用させ，前胸部から心嚢部に radioisotope の集積を認め，chylopericardium と診断した例を経験した．リンパ管造影では胸管と心嚢腔との連絡が明瞭に証明され，肺野のリンパ管系にも造影剤の逆流を認めた．この逆流像も γ-カメラ でとらえることができた．心膜開窓術と胸管結紮術後に再び RI を服用させたが，心嚢腔に集積はなく，完治したと考えられた．この方法は小児や全身状態のすぐれない chylopericardium を診断する上に非常に有用な方法である．

References

1) Groves LK, Effler DB: Primary chylopericardium. New Engl J Med **250**: 520, 1957
2) Hudspeth AS, Miller HS: Isolated (primary) chylopericardium. J Thorac Cardiovasc Surg **51**: 528, 1966
3) Yankopoulous NA, Akbarian M, Starkey GWB, Abelman WH: Isolated chylopericardium. Diagnosis, hemodynamic studies and surgical treatment. Am J Cardiol **19**: 440, 1962
4) Fujiseki Y, Goto M, Yamasaki S, Ohta S, Sono J, Mori A: A case of chronic isolated chylopericardium. Acta Paediat Jpn **84**: 457, 1980 (in Japanese)
5) Savran SV, Ratshin RA, Shirley JH, Naguwa SM, Goodman L: Idiopathic chylopericardium: ^{131}I-triolein scan for non-invasive diagnosis. Ann Int Med **82**: 663, 1975