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Respiratory Tract

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Respiratory Tract

Progress in Pediatric Radiology

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Editorial Foreword

From the days of ROENTGEN's discovery, Pediatric Radiology has played its role as an integral part of the newly evolving speciality, as well as of pediatrics. As the result of intensified interest together with advances in technology, the last 15 years have brought an ever increasing amount of information in the field of diagnostic roentgenology during infancy and childhood. At present, roentgen methods are among the most important tools in the diagnosis of pediatric disorders.

It is the impression of the Editorial Committee of this series that pediatric radiology is growing at such a rapid pace that a periodic review of newer information available and a critical appraisal of time-honoured concepts might be welcome to the people working in this field—pediatric and general radiologists as well as pediatricians. In an attempt to supplement the information available in textbooks and in the various specialty journals, this series aims at drawing information together, placing emphasis on some areas of current interest and on developments in centers of pediatric radiology throughout the world. While these volumes are planned to reflect, in reasonably orderly fashion, present thinking and approach in selected fields, it is not our aim to arrive at a complete coverage in the form of an encyclopedia.

For Volume I we have selected the 'Respiratory Tract', since this is still the area where in any institution or practice the largest percentage of roentgenograms is obtained.

The different opinions expressed in the individual articles are entirely those of their authors and reflect to the best of their knowledge their present personal approach to the problems they were given by the Editorial Committee.

That this publication appears in English exclusively is the expression of the historical fact that this language has taken the place of Latin as the vehicle for international scientific exchange. It should in no way be con-

sidered as a discriminatory attitude of the Editors towards any other language. As evidence of this approach, British and American English appear side by side, just as illustrations have been printed as submitted by our authors. An attempt, however, has been made as far as possible, to use proper radiologic terminology.

The idea of a 'Special Treatment' article has been adopted from 'Current Anthropology' where it is used with obvious success. We are happy to acknowledge this fact and the courtesy of CA and its chief editor SOL TAX in advising us on their experience with this approach.

It is most gratifying to have passed through all the preliminary problems of such a publication and to be able to acknowledge the encouraging response of my friends on the Editorial Committee and of all the authors approached for contributions, together with the continued confidence and support of the publisher in the preparation and production of this first volume.

Basel, Autumn 1966 H. J. KAUFMANN

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General Topics

Progr. Pediat. Radiol., vol. 1, pp. 3–17 (Karger, Basel/New York 1967)

Standard Roentgen Examinations in New-Borns, Infants and Children: Techniques, 'Portable' Films, Immobilization Devices and Fluoroscopy

Lawrence A. Davis[1]

Without proper radiographic technique, proper film interpretation is difficult, if not impossible. In no branch of radiology is the attainment of proper technique more important than in pediatric radiology. And within this subdivision, chest radiography must be most precise and technically perfect.

In the examination of the chest, the pediatric patients must be further subdivided into three groups, each of which has its own requirements and its own techniques. First, there is the newborn and infant who cannot cooperate. Then, there is the toddler, or small child group. These patients, in many cases, with persuasion can partially cooperate and require their own special techniques. Lastly, the larger child or adolescent can be handled as an adult.

All chest radiographs have the same purpose; to achieve the maximum detail and the optimum contrast in the various positions desired by the radiologist. This should be accomplished with minimal radiation dosage, particularly to the gonads. The technique should be readily implemented in any general radiological department with a minimum of special equipment. The technique should not require personnel to immobilize the patient, and the general rule of one patient to one technician should be applicable.

Several texts concerning pediatric roentgen technique are available (Shurtleff 1962; Darling 1962). The following techniques are those which are currently used in the Radiology Department of the Children's Hospital. They have been tested over a long period, are readily taught to student technicians and use simple, generally available materials. No nurse or aide is used for additional immobilization and the technician is shielded while exposing the film behind the central panel in the usual location.

In Figure 1 are shown the simple materials used in chest radiography.

1 From the Department of Radiology, The University of Louisville Medical School and The Children's Hospital, Louisville, Kentucky (USA).

The Chest Examination of the Infant

Basic immobilization techniques can be simple. The infant's arms are placed in a towel loop, which has been previously formed from a simple towel and safety pins (Fig. 2). The size of the towel is adjusted to the relative size of the infant. The use of stockinette (the type used by orthopedic surgeons as skin covering under plaster casts) is also recommended. The two-inch size is excellent for newborns and infants and is cut off in approximately six-inch strips from the roll (Fig. 3). Either the towel loop or the stockinette is placed over technician's right forearm, which then grasps the infant's arms as shown in the illustrations. The free left hand then works the material over the infant's elbows with the upper extremities held behind the head. When properly adjusted over the infant's upper extremities, this position is not uncomfortable, and, with the infant's head lying on the immobilizing material, the entire upper half of the body is stabilized.

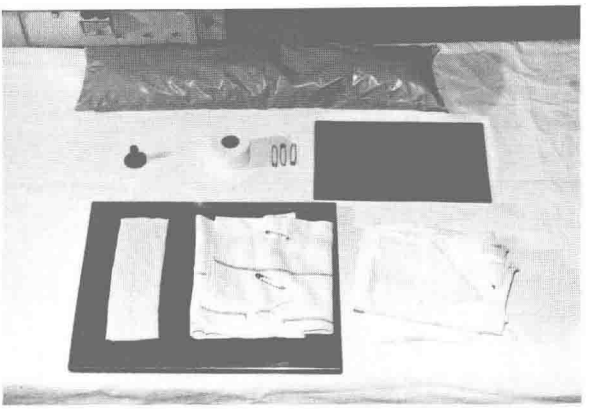
The infant is then placed upon the cassette with the chest properly positioned and the lower portion of the body immobilized with a standard compression band or with adhesive tape. A sandbag placed under the knees helps to maintain the true frontal position. Since in chest radiography, there is no need for the gonadal area to be directly exposed, a large piece of thick lead rubber is laid across the lower abdomen and pelvis. Proper coning of the beam is desirable and is required, but the lead shield is double insurance against direct gonadal irradiation. A simple rubber nipple held by a piece of adhesive tape will often quiet an irritable infant (Fig. 4).

The standard lateral chest is obtained as shown in Figure 5. A sandbag (which is hidden in this illustration by the compression band) between the infant's legs helps maintain this position. Adhesive band strips are used as necessary to hold the shoulders and head firm. Where contact with the baby's skin is necessary, the adhesive is folded upon itself so that the sticky

Fig. 1. Simple materials used in chest radiography. In the front, lying on the cassette is a strip of stockinette and a folded, pinned towel loop. To the right is a stack of folded towels. In back is a nipple, a roll of adhesive tape, safety pins, and a piece of thick lead rubber. In the rear is a sandbag. Different sizes should be available.

Fig. 2. This demonstrates the towel loop being placed over the infant's arms while he is steadied against the table by the technician's body. The left hand can be used to work the loop so that it covers the arms and forearms.

Fig. 3. The stockinette is used similarly to the towel loop. The latter is stronger and should be used on the bigger infants and uncooperative toddlers. The stockinette is ideal for the smaller infant.



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sides do not contact the infant directly. A few folded towels under the chin are used to maintain the head in the lateral position. Oblique films are made in a similar manner with folded towels used to stabilize the body in the proper position (Fig. 6).

The patients shown in the illustrations are dressed in hospital gowns which are soft and contain no foreign materials. In outpatients, it is preferable to strip the child from the waist up so that clothing artefacts can in no way interfere with the desired film.

Several devices have become commercially available in the past for immobilizing infants. Some are probably no longer available. A simple device called the 'brat board' (MILLER 1952) can be readily made in any small shop from either plywood or plastic material. Elastic bandages are used for immobilization. We have found some of these devices satisfactory, but have always reverted to the simple techniques described above. It is probably unwise to use any material which cannot be discarded after each examination since they may carry infection from patient to patient. Therefore, the towels are only used once before laundering and the stockinette is discarded. It is wise to periodically clean the radiographic table top with antiseptic solution in an attempt to prevent cross-contamination in the X-ray department, or to cover it with a clean sheet before each examination. The role of the radiographic department in cross-infection has not been adequately explored.

In all chest radiography it should be stressed that the settings on the control panel should be set *before* the infant is positioned or the child is placed before the cassette. The more skilled the technician, the less likely will the infant's film be made in expiration. Close observation of the thorax is required to time the exposure properly. Since crying is done during expiration, the pause following a long cry with the inspiratory gasp for air is a good marking device for film exposure during inspiration.

Fig. 4. The infant is immobilized and ready for the frontal chest film. Note the lead rubber strip protecting the gonads, the nipple in place, the sandbag under the knees stabilized by the compression band.

Fig. 5. The infant in position for the lateral film of the chest. A few folded towels help maintain the head in a lateral plane with an adhesive tape strip holding the head, also. The adhesive is folded upon itself where it touches the skin.

Fig. 6. The patient is positioned similarly to the lateral film, but held in the posterior oblique position by folded towels placed under the thorax and back (not seen in illustration).