

Editorial

Orthopedic radiometry

Quantitation and correlation

The locomotor system is the target of half of all conventional radiographic examinations, and the new radiology is increasingly used for this purpose even though most of the methods were introduced for other organs: notably, radionuclide scintimetry of the thyroid, sonography of the heart, computed tomography of the brain, and magnetic resonance imaging in gastroenterology.

Roentgen stereophotogrammetry has the central stage in this issue of *Acta Orthopaedica Scandinavica*: two regular articles, a review, and two supplements—one on motion analysis of the foot and the other a reprint of Selvik's (1974) thesis, the original description of the method. *Acta* is proud to pay this compliment to Dr. Selvik, a rare but not unique event—Hermodsson's (1934) thesis on shoulder dislocation was republished after 30 years by Mosley and Övergaard (1963). The reasons for republication of Hermodsson's and Selvik's theses are the same: both widely quoted classics, out of print, and unavailable for students of their ideas.

The immediate importance of roentgen stereophotogrammetry is a striking improvement over conventional radiography in the spatial resolution of objects, particularly skeletal landmarks. This explains why the method has such wide applications in the analysis of articular-motion patterns, growth, repair, and migration of fixation devices and prosthetic components.

Roentgen stereophotogrammetry should have a stimulating effect on orthopedic radiology that transcends the immediate applications of the method: It places quantitation into dramatic focus. All the new methods that have revolutionized orthopedic radiology in less than 20 years provide digital information, which can be displayed as graphic images, but also contains quantitative information of potential scientific and clinical use. Pattern recognition will always provide the basis for diagnostic radiology, but we must now identify more quantitative parameters. The staging of arthrosis of the knee is no longer based on the presence or absence of osteophytes, but rather on the width of the joint space precisely expressed in angles or millimeters, which in turn dictates osteotomy or arthroplasty as the procedure of choice. Likewise, the interpretation of radionuclide tracer studies of the skeleton is no longer merely topologic, but increasingly quantitative: Radionuclide scintimetry provides a far more precise prediction of the prognosis of the femoral head following intracapsular fracture than does radiographic assessment of the displacement. Sonographic examination for synovitis of the hip requires precise quantitation, and quantitative computed tomography is on its way to becoming a routine.

The new radiology has confronted orthopedics with a frustrating problem of optimal correlation of the new techniques. Where in the timetable of femoral head necrosis is radionuclide scintimetry or magnetic resonance applicable? Is sonography or computed tomography the method of choice for the diagnosis of hip joint tamponade? Has sonography developed into an objective "gold standard" for the diagnosis of congenital dislocation of the hip? What is the correlation between pressure measurements and radiologic diagnosis of a joint tamponade or compartment syndrome? All of these questions need answers in the scientific forum to make the new radiology relevant in clinical orthopedics. These questions also require answers for the economic debate on the optimal use of our resources.

In his book *Medicine and the Reign of Technology*, Reiser (1984) provides a historic account of the introduction into medicine of quantitative methods ranging from the pulse rate and body temperature to the advanced technologies of radiology. Two facts stand out from Reiser's book: first, that the enormous progress we have made over the last 200 years in diagnosis and treatment of diseases is intimately linked with improved quantitation of physiologic and pathologic phenomena, and secondly, that this trend has been strongly opposed every step of the way. The idea to measure the pulse rate or body temperature was opposed by the old guard defenders of the art of medicine. Today, it may be difficult even to understand their arguments. Such attitudes may still hamper the transition of radiology into radiometry for improved quantitation and correlation of orthopedic examination techniques.

REFERENCES

- Hermodsson I. Roentgenologische Studien über die traumatischen und habituellen Schulterverrenkungen nach vorn und nach unten. Thesis, University of Lund, Lund, Sweden 1934. Also published in *Acta Radiol* 1934; (Suppl 20).
- Hermodsson's Roentgenological Studies of Traumatic and Recurrent Anterior and Inferior Dislocation of the Shoulder Joint (Eds: Moseley H F, Övergaard B.). McGill University Press, Montreal 1963.
- Kärholm J. Roentgen stereophotogrammetry. Review of orthopedic applications. *Acta Orthop Scand* 1989; 60(4):493-505.
- Reiser S J. *Medicine and the Reign of Technology*. Cambridge University Press 1978.
- Selvik G. A roentgen-stereophotogrammetric method for the study of the kinematics of the skeletal system. Thesis, University of Lund, Lund, Sweden 1974.
- Selvik G. Roentgen stereophotogrammetry. A method for the study of the kinematics of the skeletal system. *Acta Orthop Scand* 1989;60(Suppl 232):1-51.