Childhood fractures may indicate bone-density problems

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Broken bones may seem like a normal part of an active childhood. About 1 in 3 otherwise healthy children suffers a bone fracture. Breakage of the bone running from the elbow to the thumb side of the wrist (distal forearm fracture) is the most common. It occurs most often during the growth spurt that children typically undergo in early adolescence.

But a recent study at Mayo Clinic, published in the *Journal of Bone and Mineral Research*, indicates that certain types of fractures may have implications for a child's long-term bone health. The study found evidence that children and adolescents whose forearm fractures occurred due to mild trauma had lower bone strength compared to other children. Lower bone strength may predispose children to factures resulting from weakened bone (osteoporotic fracture) later in life.

"Our study highlights the need for clinicians to consider the level of trauma preceding the injury, when treating children and adolescents who present with fracture," says Joshua Farr, Ph.D., a research fellow at Mayo Clinic in Rochester and lead author of the study. "Fractures from moderate trauma appear more likely to occur in the setting of normal bone strength. But fractures resulting from mild trauma suggest an underlying skeletal deficit."

"We can't say with certainty that these skeletal deficits will track into adulthood. They may be transient," Dr. Farr adds. "But we think that trauma classification is a clinical variable that could be used to more

closely monitor kids who are suffering mild-trauma fractures. Intervention in terms of diet and physical activity might be used to optimize bone strength."

The Mayo study compared bone strength in children with recent distal forearm fractures due to mild trauma, children with such fractures due to moderate trauma, and children without fractures. Mild trauma was defined as a fall from a standing height, and moderate trauma was defined as a fall from a relatively low height, such as from a bicycle. The children were aged 8 to 15, and included 108 control participants and 115 boys and girls treated for distal forearm fracture at Mayo within the previous 12 months.

Study participants underwent a sophisticated version of CT known as high-resolution peripheral quantitative computed tomography (HRpQCT) to assess bone strength and quality. Trauma levels were assigned based on clinical notes, radiology reports and interviews with clinicians, parents and patients.

Compared with sex-matched controls, boys and girls with a mild-trauma distal forearm fracture had weaker bones. Their bones were able to tolerate less stress before fracturing, and they had thinner cortical bone—the outer layer of bone tissue that carries out most of the functions of bone. The Mayo researchers' methodology differed from that used in previous research that found no difference in bone density in children with mild- and moderate-trauma fractures. That previous work relied on dual energy X-ray absorptiometry (DXA), a 2-dimensional technique that measures bone mass but not bone-tissue density.

"DXA can't measure the structural components of the bone, which are very important contributors to the overall strength of bone," Dr. Farr says.

The previous research also used mailed questionnaires to assess trauma level. "We had very detailed information from the data sources that Mayo allows us to have, so we are confident of our ability to classify the traumas," Dr. Farr says.

The study highlights Mayo's increased emphasis on pediatric research, which led to the recent establishment of the Children's Research Center at Mayo in Minnesota. Funding for the pediatric bone-density study was provided by the National Institute of Arthritis and Musculoskeletal and Skin Diseases and by Mayo's Clinical and Translational Science Award.

The patient studies, which involved fasting blood tests and biochemical assays as well as bone imaging and interviews, were conducted at the outpatient Clinical Research Unit (CRU) at Mayo in Minnesota. "It wouldn't be possible to do this type of clinically intensive study without the infrastructure that's available at the CRU," Dr. Farr says.

Provided by Mayo Clinic