

## Human Parathyroid Hormone for Treating Osteoporosis

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### Clinical Question

What is the role of human parathyroid hormone in the treatment of osteoporosis in women?

### Evidence-Based Answer

Human parathyroid hormone should be used in patients with severe osteoporosis to decrease the rate of vertebral and nonvertebral fractures. (Strength of Recommendation [SOR]: A, based on a systematic review and randomized controlled trial [RCT].) The parathyroid hormone teriparatide (Forteo) should be reserved for patients who do not respond to bisphosphonates or who have severe bone loss. (SOR: C, based on expert opinion.)

### Evidence Summary

Teriparatide is a recombinant human parathyroid hormone. It is approved for the treatment of severe osteoporosis that does not respond to other osteoporosis therapies or in patients who do not tolerate other therapies. The dosage is 20 mcg daily by subcutaneous

injection for two years.<sup>1</sup> The studies included in this summary were funded by the manufacturer of teriparatide, which introduces the possibility of bias.

A systematic review concluded that teriparatide significantly increased bone density in the spine and hip, and significantly reduced the risk of new vertebral and nonvertebral fractures in postmenopausal women with previous vertebral fractures.<sup>2</sup> This review included two double-blind RCTs of teriparatide versus alendronate (Fosamax) in postmenopausal women with osteoporosis (Table 1<sup>3,4</sup>). Both studies found statistically significant increases in bone density in the lumbar spine in patients taking teriparatide ( $P < .001$ ).<sup>3,4</sup> Vertebral fractures were not assessed. There was a decrease in nonvertebral fractures over 14 months (number needed to treat [NNT] = 10; 95% confidence interval [CI], 5 to 1,072).<sup>4</sup> An RCT of 1,637 postmenopausal women with previous vertebral fractures compared 20 mcg of teriparatide per day with placebo.<sup>5</sup> After 18 months, the NNT to prevent one

**Table 1. Teriparatide vs. Alendronate for Increasing Bone Mineral Density in Postmenopausal Women with Osteoporosis**

Study	Treatment	No. of patients	Study duration	Difference in increased lumbar spine bone density (favoring teriparatide)
McClung, et al. <sup>3</sup>	20 mcg of teriparatide (Forteo) per day vs. 10 mg of alendronate (Fosamax) per day	203	18 months	4.8 percent; $P < .001$
Body, et al. <sup>4</sup>	40 mcg of teriparatide per day vs. 10 mg of alendronate per day	146	14 months (median)	8.5 percent; $P < .001$

Information from references 3 and 4.

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vertebral fracture was 11 (95% CI, 8 to 18). There was a reduction in nonvertebral fractures (NNT = 28; 95% CI, 15 to 469). A follow-up study of 1,262 of the same patients 18 months after they had finished treatment found that the fracture risk reduction persisted after therapy.<sup>6</sup> In the posttreatment period, the NNT to prevent a new vertebral fracture was 13 (95% CI, 8 to 18).

An RCT of 428 men and women with glucocorticoid-induced osteoporosis compared 20 mcg of teriparatide per day with 10 mg of alendronate per day.<sup>7</sup> After 36 months, there were fewer new vertebral fractures in the teriparatide group (1.7 versus 7.7 percent;  $P = .007$ ). The NNT was 16 (95% CI, 9 to 69). The incidence of nonvertebral fractures was similar between the two groups and not statistically significant. Both drugs increased bone mineral density; however, teriparatide had a greater effect than alendronate. There was a statistically significant but small difference in the percentage increase in bone mineral density in the lumbar spine, hip, and femoral neck favoring the teriparatide group (5.7, 2.5, and 2.9 percent difference, respectively;  $P < .001$  for all three sites).

A European observational study of 1,648 postmenopausal women with osteoporosis treated with teriparatide for 18 months found a 47 percent decrease in the fracture risk in the last six months of the study compared with the first six months.<sup>8</sup> The NNT to prevent one fracture per year was 20 (95% CI, 14 to 55). Although these studies suggest a slight benefit of teriparatide when compared with alendronate, the retail cost of teriparatide is more than 10 times that of alendronate (Table 2).

### Recommendations from Others

Practice guidelines from the American College of Obstetricians and Gynecologists recommend teriparatide therapy in patients with osteoporosis that does not respond to antiresorptive therapies, and in patients with severe disease.<sup>9</sup> Guidelines from the American College of Physicians recommend that men and women with osteoporosis be offered bisphosphonates as initial treatment, and state that there is good evidence that teriparatide decreases vertebral and nonvertebral fractures.<sup>10</sup> The National Osteoporosis Foundation recommends consideration of teriparatide therapy in patients with osteoporosis and a high risk of fracture, such as those taking sustained glucocorticoid therapy.<sup>11</sup>

The opinions and assertions contained herein are the private views of the authors, and are not to be construed as official, or as reflecting the views of the U.S. Air Force Medical Service or the U.S. Air Force at large.

**Table 2. Cost Comparison of Select Medications for Osteoporosis**

Medication	Dosage	Cost*
Alendronate (Fosamax)	10 mg orally, once per day	\$72 (\$95)
Ibandronate (Boniva)	150 mg orally, once per month	NA (\$129)
Raloxifene (Evista)	60 mg orally, once per day	NA (\$150)
Risedronate (Actonel)	5 mg orally, once per day	NA (\$141)
Teriparatide (Forteo)	20 mcg subcutaneously, once per day	NA (\$1,016)

NA = not available.

\*—Estimated retail price of one month's treatment based on information obtained at <http://www.drugstore.com> (accessed November 22, 2011). Generic price listed first; brand price listed in parentheses.

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