SP:2
Calcitonin treatment of osteoporosis in quadriplegic cerebral palsy

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Objectives: Disuse osteoporosis and fractures are common in children with quadriplegic cerebral palsy (CP). Even with adequate intake of calcium and vitamin D, pathologic fractures occur. This investigation studied the therapeutic effect of calcitonin nasal spray on CP disuse osteoporosis.
Design: Quantitative research using before-during treatment data.
Setting: Two pediatric skilled nursing facilities that care for children with severe CP (Little Angels, Elgin, IL and Marklund, Bloomingdale, IL).
Participants: Twenty-four individuals with quadriplegic CP, who had a fracture, were identified (age range 9–33 years; mean 20 years; 10 females, 14 males). All had quadriplegic CP, were wheel-chair bound, and 20 were fed by gastrostomy tube. All were receiving adequate amounts of calcium and vitamin D. None had received any steroid treatments.
Measurements: All underwent bone mineral density determinations using a Hologic QDR-1000 X-ray Bone Densitometer (DXA), before and after 1, 2, and 3 years of treatment. Each was treated with one calcitonin nasal spray (=200 units), 5 times per week, 3 months of treatment alternating with one month of no treatment. Two were treated for 1 year, 15 for 2 years, and 7 for 3 years. This investigation was approved by ethics review committees, and informed consent was obtained from the guardians.
Main Results: DXA results indicated severe osteoporosis in all cases. After calcitonin treatment, BMD determination changes were determined for the lumbar spine in 20 patients, and for the total hip in 15.

There was a statistically significant increase in lumbar spine BMD, with calcitonin treatment, in younger individuals ($p<0.05$). Those who were younger than 19 years had a mean increase of 6.1% per year in spine BMD. In those over 19, BMD increased 0.2% per year. A similar trend, that was not statistically significant, was seen in total hip BMD determinations, where in those younger than 19 years, BMD increased, a mean of 8.5% per year. In those over 19, hip BMD decreased a mean of 1.8% per year.
Conclusion: These results indicate that calcitonin may be an effective treatment of CP disuse osteoporosis and that better responses may occur in younger individuals.

SP:3
Osteoporosis in quadriplegic cerebral palsy: risk factors, protective effect of epilepsy and anticonvulsants

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Objectives: Disuse osteoporosis and fractures are common in children with quadriplegic cerebral palsy (CP). Even with adequate intake of calcium and vitamin D, pathologic fractures occur. We investigated risk factors that may be associated with the development of disuse osteoporosis in patients with severe CP.
Design: Quantitative research using clinical and laboratory data.
Setting: Two pediatric skilled nursing facilities that care for children with severe CP (Little Angels, Elgin, IL and Marklund, Bloomingdale, IL).
Participants: Thirty-two individuals with quadriplegic CP, who had a fracture, were identified (age range 7–33 years; 12 females, 20 males). All had quadriplegic CP, all were wheelchair bound, 4 had a tracheostomy and 25 were fed by gastrostomy tube. All were receiving adequate amounts of calcium and vitamin D. Twenty-four were receiving anticonvulsants for epilepsy. None had received any steroid treatments.
Measurements: All underwent bone mineral density Z-score determinations using a Hologic QDR-1000 X-ray Bone Densitometer (DXA). Hip BMD results were obtained in 16 cases, and lumbar spine in 27. Clinical data was correlated with the Z scores using Pearson's product moment correlation and multiple linear regression analysis. This investigation was approved by ethics review committees, and informed consent was obtained from the guardians.
Main results: Using the hip BMD results, there was a protective affect associated with the female sex ($p=0.004$) and the use of carbamazapine ($p=0.045$). With the spine results, there was a correlation with age (older individuals had more severe osteoporosis; $p=0.024$). There was also a protective effect with the use of benzodiazepines used to treat seizures and spasticity ($p=0.024$). There was a mild protective effect of epilepsy which did not reach statistical significance ($p=0.124$). There was no correlation with the presence or absence of G-tube, tracheostomy, or the use of valproic acid, phenytoin, or phenobarbital.
Conclusion: These results indicate that age and the male sex are significant risk factors for the development of disuse osteoporosis in CP. The use of carbamazapine and benzodiazepines had a protective effect, as did the presence of epilepsy. There was no effect on osteoporosis by the use of valproic acid, phenytoin nor phenobarbital.

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