Calcium gluconate

Introduction
Hypocalcaemia presents with symptoms ranging from paraesthesia and muscle cramps, to tetany with the classical features of carpo-pedal spasm, laryngeal stridor and convulsions. Calcium gluconate is a calcium supplement listed in the 2004 WHO Model Formulary as a complementary drug for the treatment of hypocalcaemic tetany. No other calcium supplements are listed for this (or any other) indication.

Product and Dosage
Calcium gluconate is listed as a solution for intravenous injection. The solution contains calcium gluconate (monohydrate) 100 mg (Ca$^{2+}$ 220 micromol)/ml, 10-ml ampoule.
Adult dosage for the treatment of hypocalcaemic tetany is 1 g (2.2 mmol) by slow intravenous injection, followed about 4 g (8.8 mmol) daily by continuous intravenous infusion.$^1$ Supplementation should be continued till serum calcium is within the normal range. No dosage is given for children.

Evidence of value
There are no clinical trials or systematic reviews covering the treatment of hypocalcaemic tetany, and this assessment is based on 'standard' practice as reflected mainly by textbooks. Acute, symptomatic hypocalcaemia requires emergency treatment to bring the calcium concentration back to the normal range. This can be achieved by giving intravenous calcium, and calcium gluconate is the recommended calcium salt.$^2$ The advantage of calcium gluconate (90 mg elemental calcium per 10-mL ampule) is that it irritates the veins less than does calcium chloride (272 mg of elemental calcium per 10-mL ampule).$^4$ Symptoms refractory to appropriate doses of calcium may be caused by coexisting hypomagnesemia. In patients with normal renal function, administration of 2 - 4 g of 10% magnesium sulfate should be considered.$^3$

Adverse effects
The most common adverse effects of intravenous calcium are hypertension, nausea, vomiting, and flushing. Bradycardia and heart block occur in rare cases. Patients receiving IV calcium should be placed on a cardiac monitor, and administration should be discontinued if bradycardia ensues.$^3$ Patients may complain of tingling sensations, a sense of oppression or heat waves and a calcium or chalky taste following the intravenous administration of calcium gluconate. Rapid intravenous injection of calcium salts may cause vasodilatation, decreased blood pressure, bradycardia, cardiac arrhythmias, syncope and cardiac arrest.$^{14}$
Calcium should be administered with particular caution in patients taking digoxin because it may precipitate (or exacerbate) digoxin-induced cardiotoxicity. Because extravasated calcium may cause severe tissue irritation and necrosis, it should be given through a well-functioning catheter.$^3$

 Recommendation
Calcium gluconate injection is important for the acute treatment of
hypocalcaemic tetany and should be retained in the WHO Model List of Essential Medicines. Consideration should be given to the inclusion in the Model List of other forms of calcium supplementation both for the less acute treatment of hypocalcaemic tetany, and as part of the management of bone diseases such as osteoporosis.\textsuperscript{15-22}

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References
2. Goldman: Cecil Textbook of Medicine, 21st ed., Copyright © 2000 W. B. Saunders Company; P1404-06
5. Ford: Clinical Toxicology, 1st ed., Copyright © 2001 W. B. Saunders Company \textit{Hypocalcaemia} P 85-86
13 ACOG Practice Bulletin, Clinical management guidelines for Obstetrician- Gynecologists, Osteoporosis, NUMBER 50, JANUARY 2004

14 MD consult; drugs, generic drugs, Calcium Gluconate (000600)


21 National Guideline Clearinghouse (NGC), WWW.guideline.gov, Recommendations for the prevention and treatment of glucocorticoid-induced osteoporosis: 2001 update

22 Homik J. Suarez-Almazor ME. Shea B. Cranney A. Wells G. Tugwell P. Calcium and vitamin D for corticosteroid-induced osteoporosis. [Review] [5 refs] Cochrane Database of Systematic Reviews. (2):CD000952, 2000
The medical literature was searched to identify scientifically valid, systematic reviews (with or without meta-analyses) related to parenteral calcium gluconate use for the treatment of hypocalcemic tetany. Practice guidelines where also reviewed, but were considered much less valid source of scientifically rigorous findings:

Details of searches:
Search in MD Consult Practice guidelines,

The Cochrane Database of Systematic Reviews

Guidelines “search” websites:
National Guidelines Clearing house
National Library of Medicine HSTAT
NeLH Guidelines Finder
Database: Australian Centre for Evidence Based Clinical Practice (ACEBCP).
www.acebcp.org.au/terms.htm

Databases were searched using the search term “calcium gluconate”, “hypocalcemia/hypocalcaemia” and tetany.
Databases were also searched for any guidelines about using “calcium gluconate” as search term for the probable use of calcium in the treatment of hypocalcemic tetany.
In addition, Medline (OVID) was search for any available randomized clinical trial using search terms “calcium gluconate”, “calcium”and “hypocalcemic/hypocalcaemic tetany”, “hypocalcemia” and “randomized controlled trials” (RCT) in publication type.
As it was predicted there was not any RCT for “calcium” and “hypocalcemic tetany” in adult. The only available RCT was [Turner TL. Cockburn F. Forfar JO. Magnesium therapy in neonatal tetany. Lancet. 1(8006):283-4, 1977 Feb 5] comparing calcium gluconate, phenobarbitone and magnesium sulphate for the treatment of symptomatic hypocalcaemia in infants. They have recommended Magnesium sulphate as the treatment of choice in symptomatic neonatal tetany whether or not there is hypomagnesaemia

There was not any guideline or systematic review regarding the use of “calcium gluconate” for “hypocalcemic tetany”.