Traitements de l'ostéoporose

Jeudis d'Unisanté
12 mars 2026

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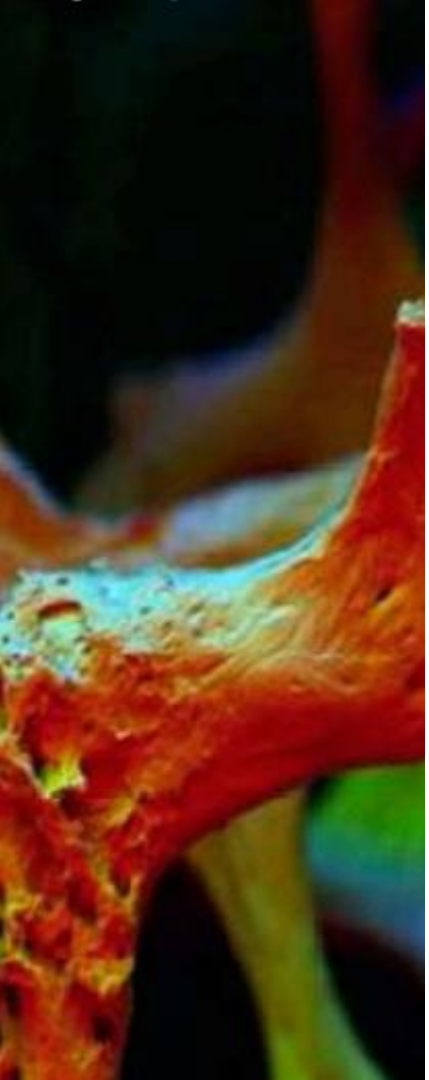
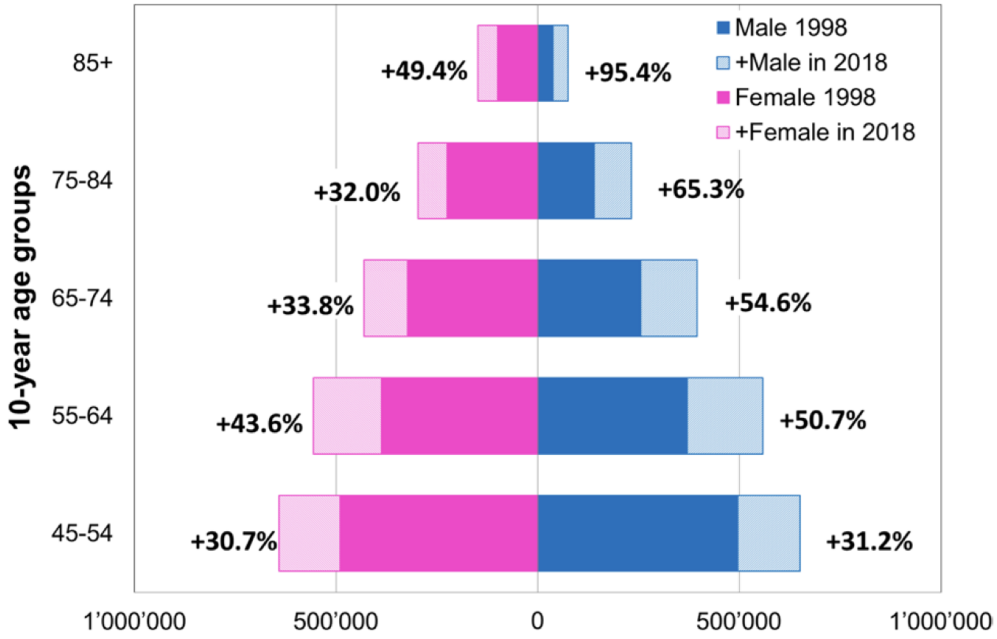


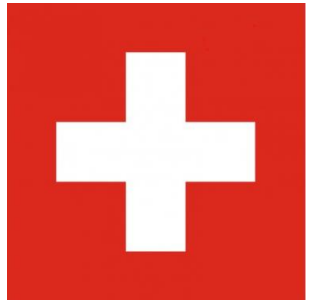
PLAN

1. Epidémiologie
2. Traitements préventifs
3. Traitements antirésorbeurs
4. Traitements anaboliques
5. Séquences de traitement
6. Conclusion

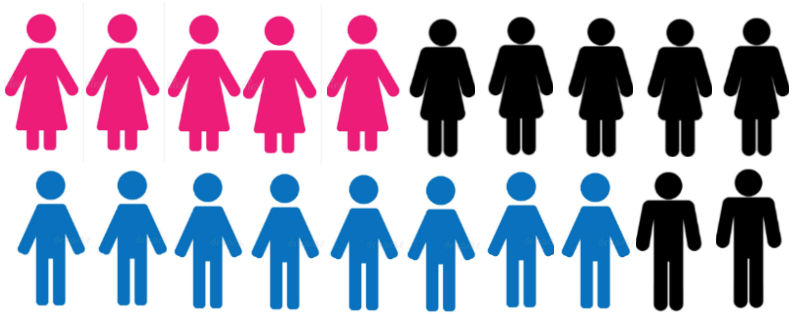
Fractures ostéoporotiques



Lippuner K. Osteoporos Int 2022



Fractures OP
> 50 ans



50%

20%

A NEW SCORECARD FOR OSTEOPOROSIS IN EU 27+2

SCOPE '21

www.osteoporosis.foundation/scope-2021

BURDEN OF DISEASE

82,000

NEW FRAGILITY FRACTURES IN 2019

226 FRACTURES PER DAY

9.4 FRACTURES PER HOUR

CHANGE IN COST PER INDIVIDUAL

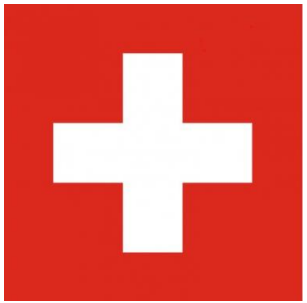
€402.8 (2019)

€190.2 (2010)

+112%

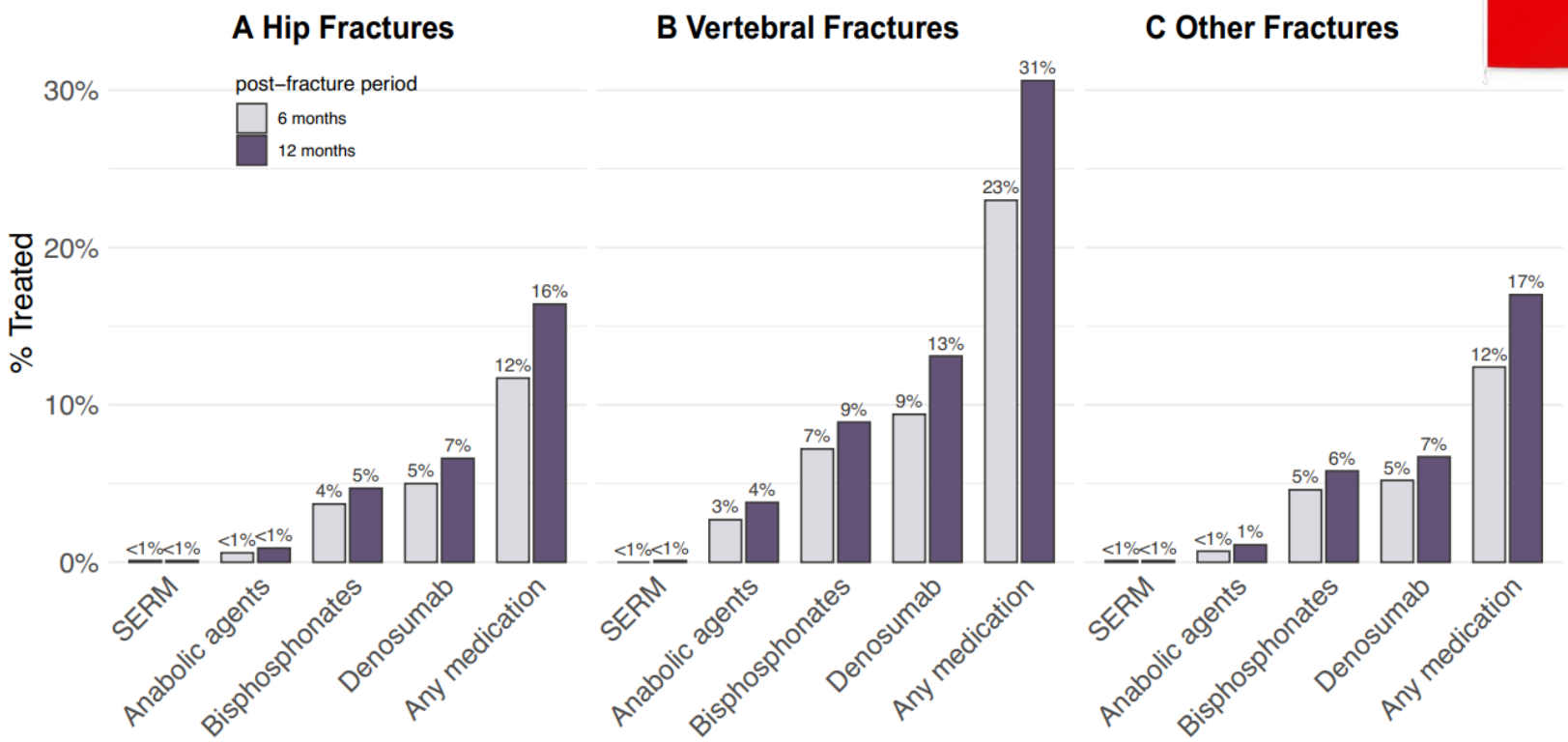
€3.4 BILLION SPENT IN 2019

€746 MILLION	€2.62 BILLION	€60 MILLION
LONG-TERM DISABILITY COSTS	DIRECT COST OF INCIDENT FRACTURES	PHARMACOLOGICAL INTERVENTION

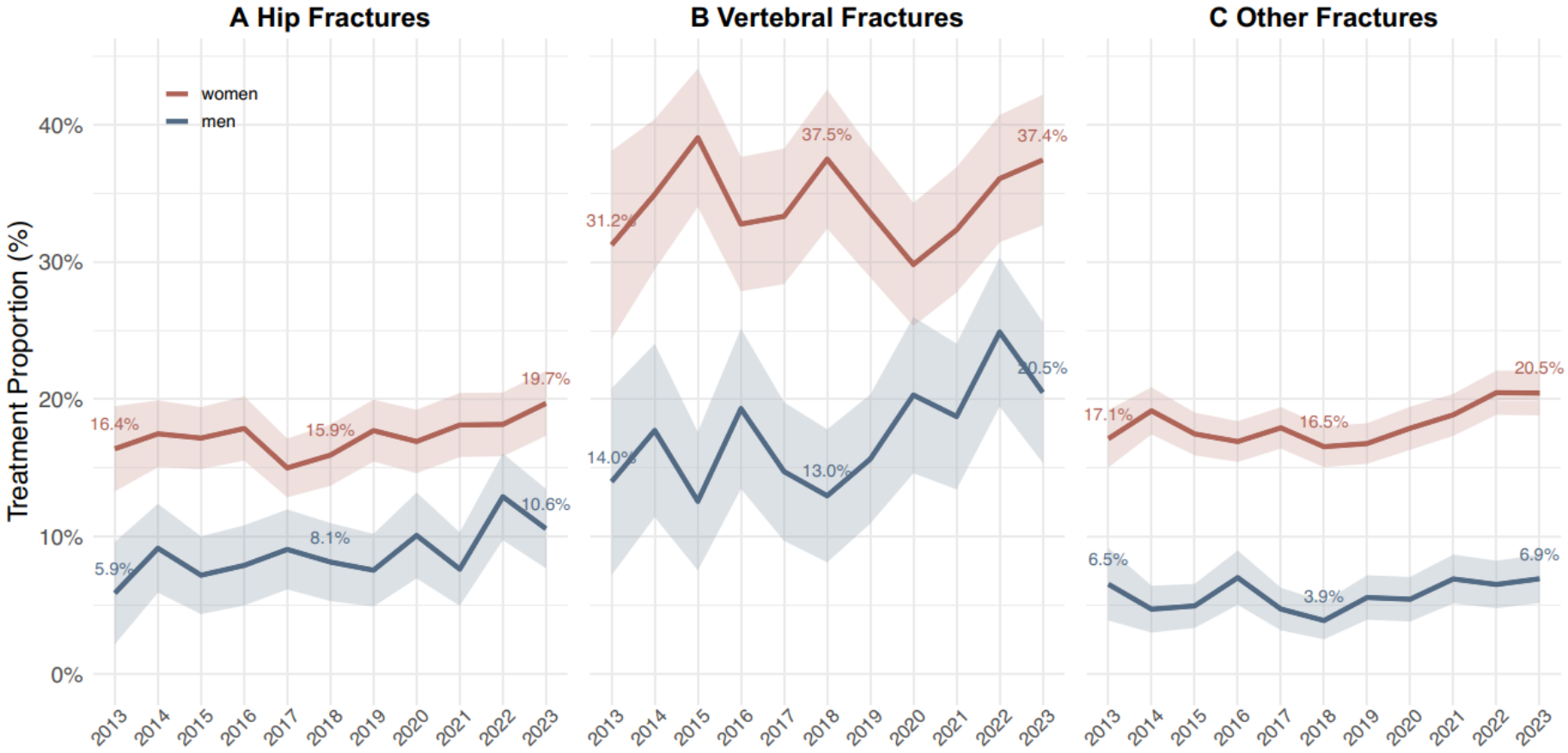


Gap thérapeutique
80%

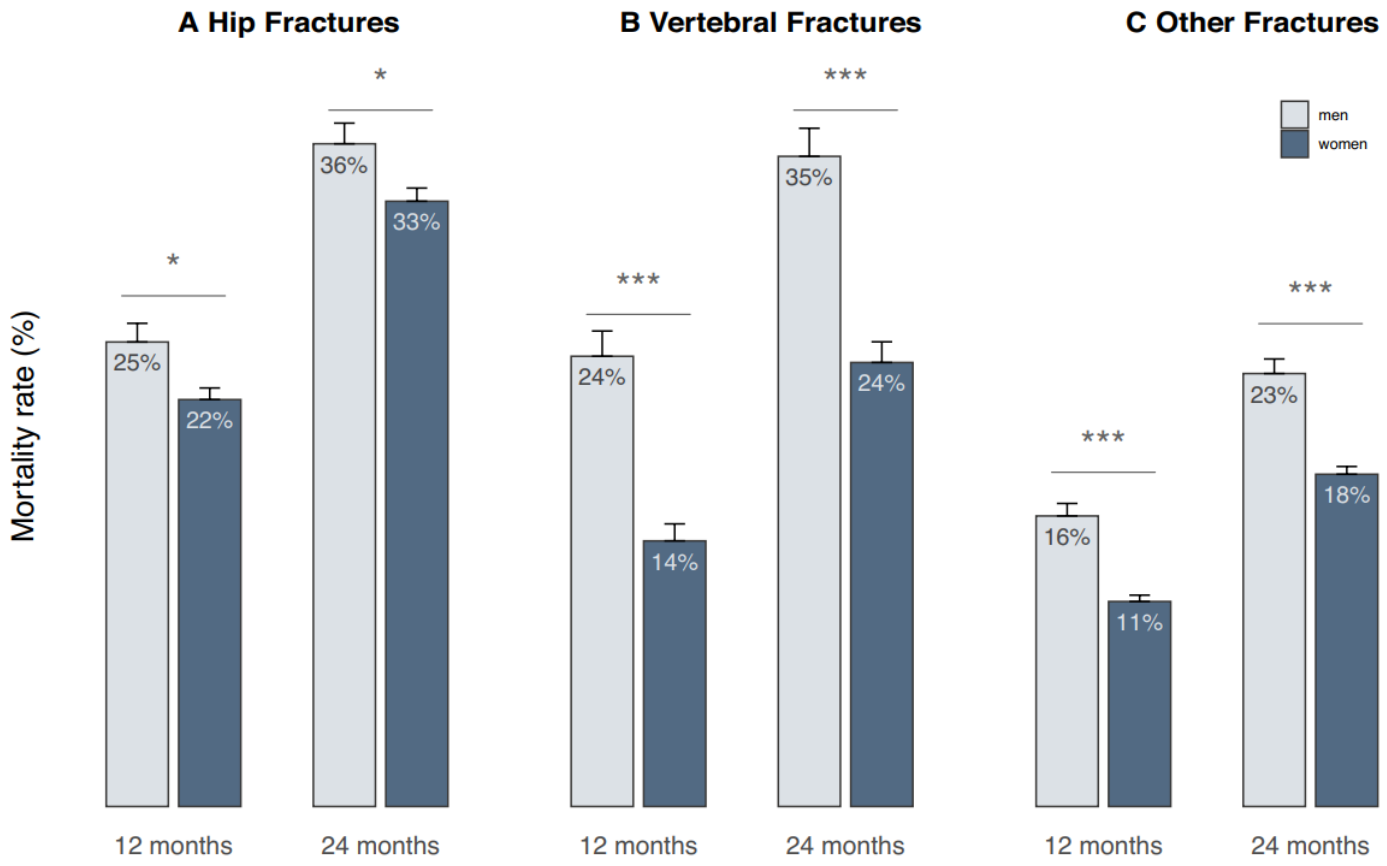
20000 patients avec une fracture ostéoporotique. Prise en charge. Données CSS

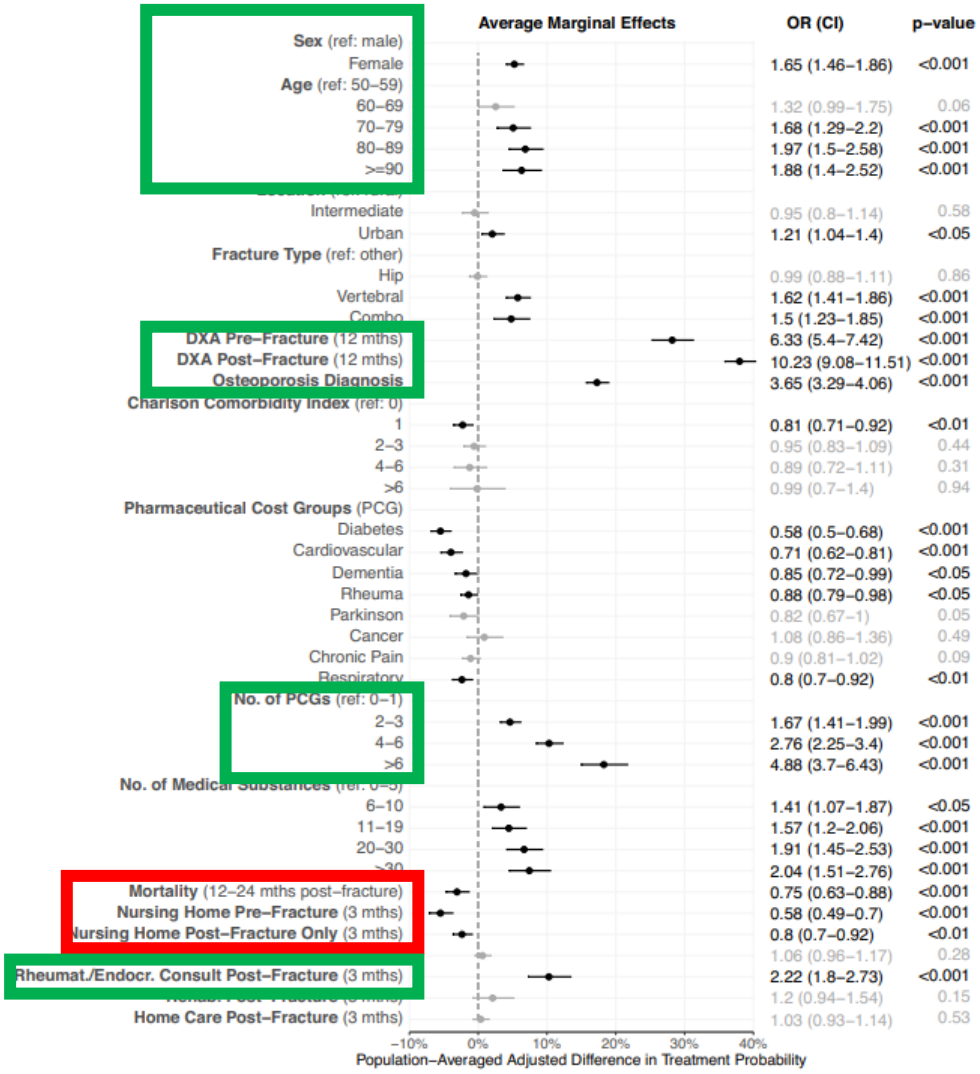


Everts-Graber J. Osteoporos Int 2026


A Hip Fractures
B Vertebral Fractures
C Other Fractures
women
men
Treatment Proportion (%)
40%
30%
20%
10%
0%
16.4%
15.9%
19.7%
5.9%
8.1%
10.6%
31.2%
37.5%
37.4%
14.0%
13.0%
20.5%
17.1%
16.5%
20.5%
6.5%
3.9%
6.9%
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

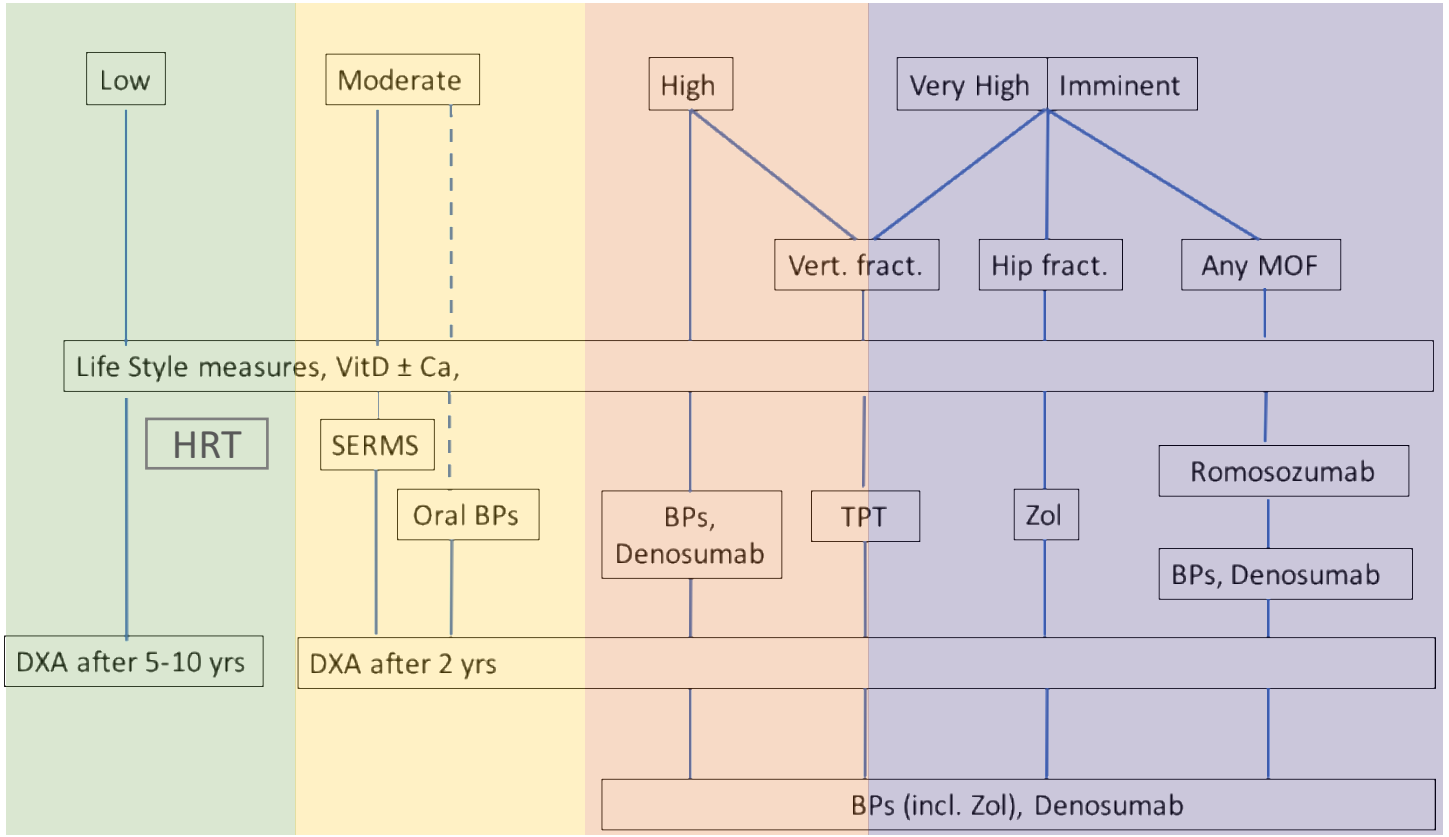
Mortalité


A Hip Fractures
B Vertebral Fractures
C Other Fractures
Mortality rate (%)
men
women
*
*
***
***
***
***
25%
22%
36%
33%
24%
14%
35%
24%
16%
11%
23%
18%
12 months
24 months
12 months
24 months
12 months
24 months


Average Marginal Effects
OR (CI)
p−value
Sex (ref: male)
Female
1.65 (1.46–1.86)
<0.001
Age (ref: 50–59)
60–69
1.32 (0.99–1.75)
0.06
70–79
1.68 (1.29–2.2)
<0.001
80–89
1.97 (1.5–2.58)
<0.001
>=90
1.88 (1.4–2.52)
<0.001
Intermediate
0.95 (0.8–1.14)
0.58
Urban
1.21 (1.04–1.4)
<0.05
Fracture Type (ref: other)
Hip
0.99 (0.88–1.11)
0.86
Vertebral
1.62 (1.41–1.86)
<0.001
Combo
1.5 (1.23–1.85)
<0.001
DXA Pre−Fracture (12 mths)
6.33 (5.4–7.42)
<0.001
DXA Post−Fracture (12 mths)
10.23 (9.08–11.51)
<0.001
Osteoporosis Diagnosis
3.65 (3.29–4.06)
<0.001
Charlson Comorbidity Index (ref: 0)
1
0.81 (0.71–0.92)
<0.01
2–3
0.95 (0.83–1.09)
0.44
4–6
0.89 (0.72–1.11)
0.31
>6
0.99 (0.7–1.4)
0.94
Pharmaceutical Cost Groups (PCG)
Diabetes
0.58 (0.5–0.68)
<0.001
Cardiovascular
0.71 (0.62–0.81)
<0.001
Dementia
0.85 (0.72–0.99)
<0.05
Rheuma
0.88 (0.79–0.98)
<0.05
Parkinson
0.82 (0.67–1)
0.05
Cancer
1.08 (0.86–1.36)
0.49
Chronic Pain
0.9 (0.81–1.02)
0.09
Respiratory
0.8 (0.7–0.92)
<0.01
No. of PCGs (ref: 0–1)
2–3
1.67 (1.41–1.99)
<0.001
4–6
2.76 (2.25–3.4)
<0.001
>6
4.88 (3.7–6.43)
<0.001
6–10
1.41 (1.07–1.87)
<0.05
11–19
1.57 (1.2–2.06)
<0.001
20–30
1.91 (1.45–2.53)
<0.001
2.04 (1.51–2.76)
<0.001
Mortality (12–24 mths post−fracture)
0.75 (0.63–0.88)
<0.001
Nursing Home Pre−Fracture (3 mths)
0.58 (0.49–0.7)
<0.001
Nursing Home Post−Fracture Only (3 mths)
0.8 (0.7–0.92)
<0.01
1.06 (0.96–1.17)
0.28
Rheumat./Endocr. Consult Post−Fracture (3 mths)
2.22 (1.8–2.73)
<0.001
1.2 (0.94–1.54)
0.15
Home Care Post−Fracture (3 mths)
1.03 (0.93–1.14)
0.53
−10%
0%
10%
20%
30%
40%
Population−Averaged Adjusted Difference in Treatment Probability

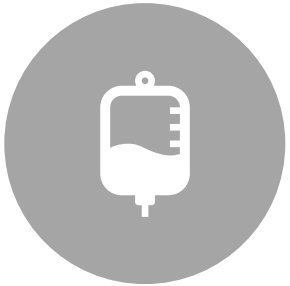
Séquence de traitement selon la sévérité (risque fracturaire)

Ferrari S. Swiss Med Weekly 2020



DXA: densitométrie, BP : bisphosphonates, TPT: teriparatide, Zol: zoledronate, MOF : major osteoporotic fracture

1. FENETRES D'OPPORTUNITE ENTRE 50 ET 65 ANS



PREVENTION DE L'OSTÉOPOROSE

1 ZOLEDRONATE → **30 - 40% FX pour 5 à 10 ans**

THM → **30% FX** ***diabète et mortalité***

SERMS → **30 - 50% FX vert** ***50% CA du sein***

PARTICIPANTS

WHO	1054 women 50 to 60 years of age; mean, 56 years
CLINICAL STATUS	Bone mineral density T scores between 0 and –2.5 at the lumbar spine, femoral neck, or total hip

NNT : 11-20

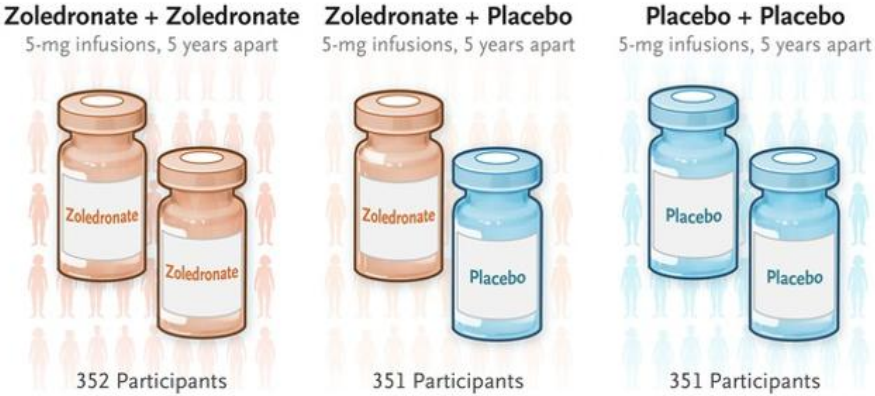
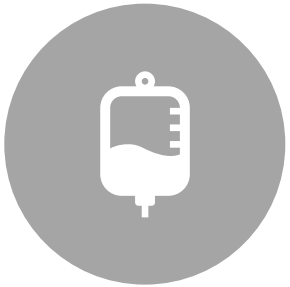


Table 2. The Effect of Zoledronate on Fracture Outcomes.*

End Point	Zol–Zol (N=352)	Zol–Placebo (N=351)	Placebo–Placebo (N=351)	Zol–Zol and Zol–Placebo (N=703)	Zol–Zol vs. Placebo–Placebo
	no. of women with ≥1 new fracture (%)				
Primary end point					
Morphometric vertebral fracture†	22 (6.3)	23 (6.6)	39 (11.1)	45 (6.4)	0.56 (0.34–0.92)‡
Secondary end points					
Fragility fracture	71 (20.2)	78 (22.2)	99 (28.2)	149 (21.2)	0.72 (0.55–0.93)
Any fracture	87 (24.7)	96 (27.4)	124 (35.3)	183 (26.0)	0.70 (0.56–0.88)
Major osteoporotic fracture	41 (11.6)	49 (14.0)	69 (19.7)	90 (12.8)	0.60 (0.42–0.86)

Bolland MJ.N Engl J Med. 2025

2. Les traitements antirésorbeurs



TRAITEMENT DE L'OSTÉOPOROSE NON FRACTURAIRE

ALENDRONATE

ZOLEDRONATE

(20)40 - (50)70% FX

DURÉE DU TTT : 3 - 5 ANS

DENOSUMAB

40 - 70% FX

DURÉE TTT : ≤ 3 ANS (> 3ANS ?)

CAVE : INSUFFISANCE RÉNALE

Bisphosphonates

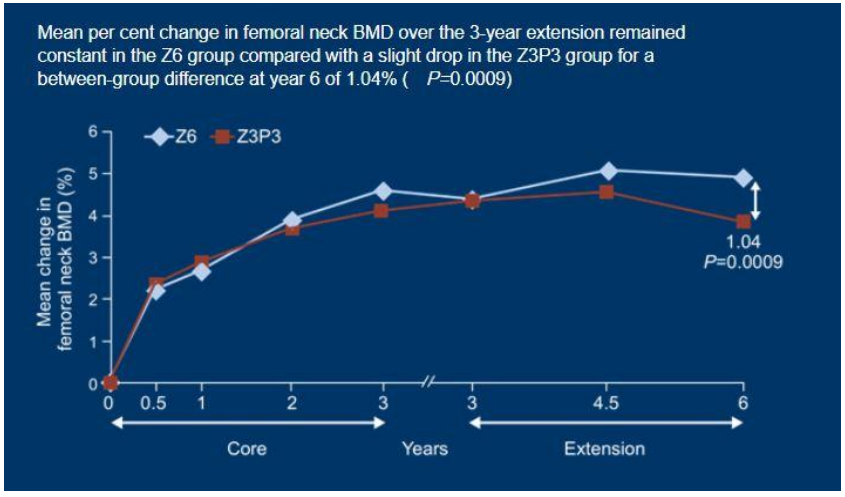
Effet plateau après 3 à 5 ans
(sous-optimal si densité très basse)

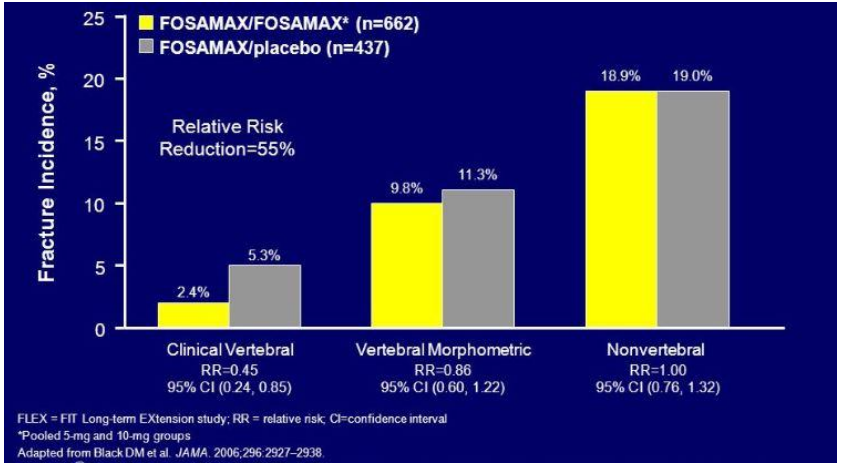
Effet antifracturaire persistant après l'arrêt
(**Zoledronate** et **Alendronate** >> RIS ou IBN)

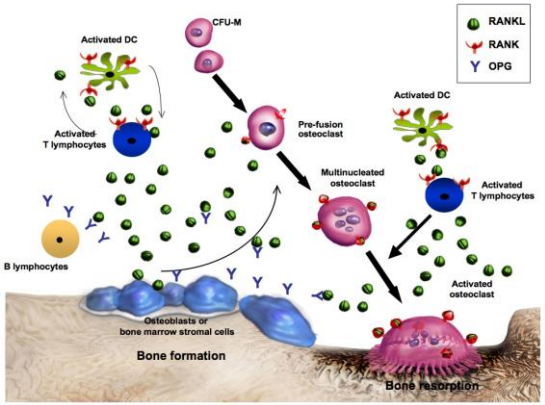
Il n'est jamais faux de débuter avec
un bisphosphonate

*Sauf pour Fx vertébrales : risque =1%/an

Black D. JAMA 2006. Black D. J Bone Miner Res 2012





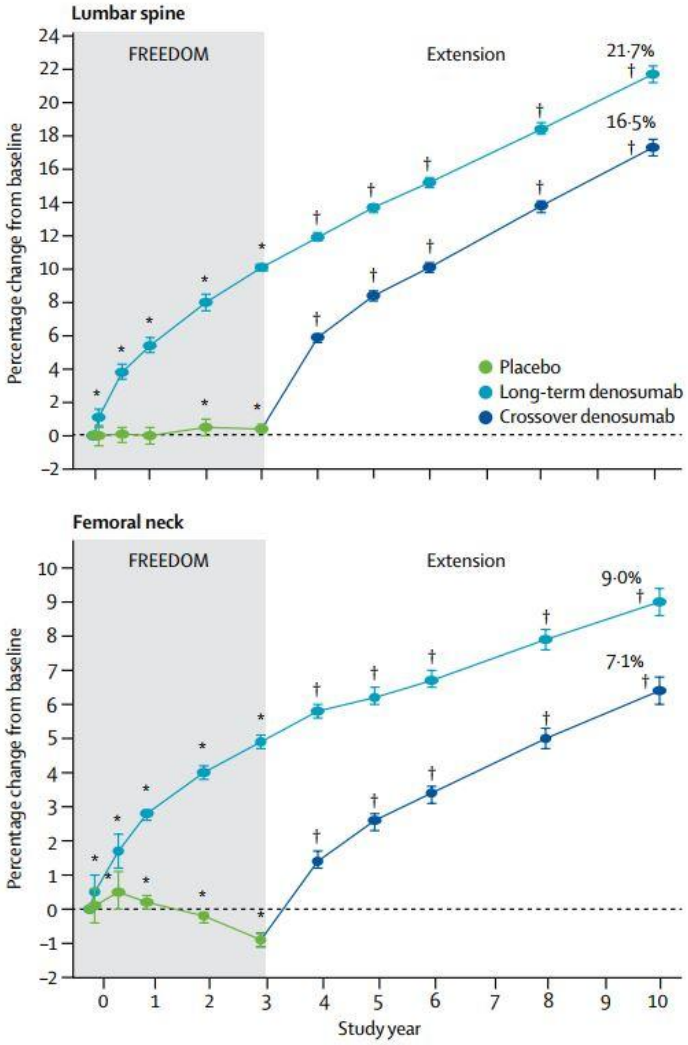


Denosumab

Effet continu au fil des années (treat to target)

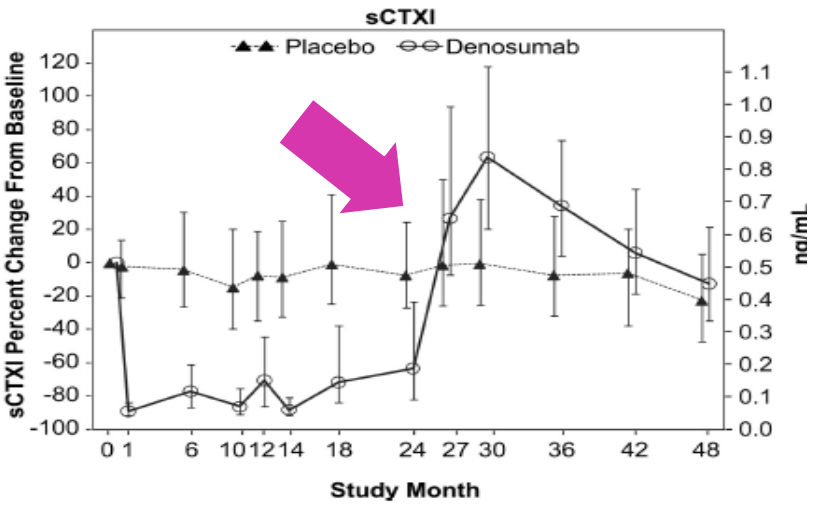
Bien toléré

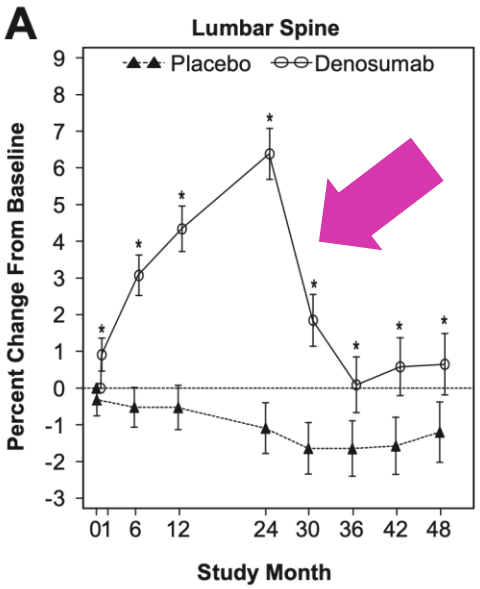
Facile à utiliser

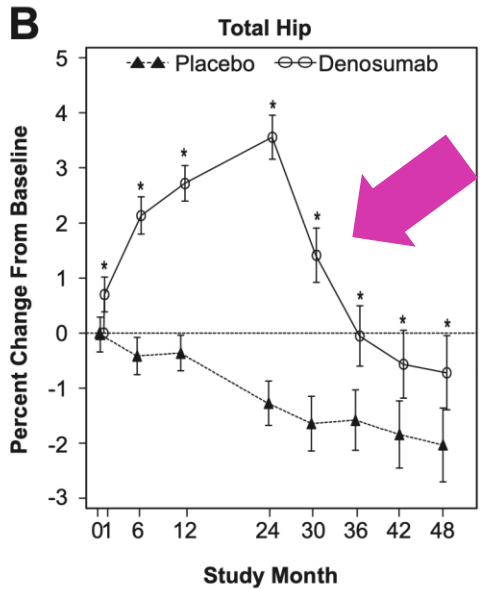


Bone HG. Lancet Diabetes Endocrinol 2017

Effet rebond à l'arrêt du Denosumab







Augmentation du risque de fractures vertébrales
Hypercalcémie
La sévérité du rebond est-elle prédictible ?

Bone HG. J Clin Endocrin Metab 2011. Aubry-Rozier B. Osteoporos Int 2016. Lamy O. J Clin Endocrin Metab 2016

Antiresorptive treatment for osteoporosis

Bisphosphonates

- Zoledronate and Alendronate : more effective than ibandronate or risedronate
- Treatment duration : 3 (iv) to 5 years (oral)
- Residual effect after discontinuation

Denosumab

- May be used for several years.
- Tx ≥ 3 years is associated with a more severe rebound effect and a higher risk of spontaneous vertebral fractures.
- High doses of bisphosphonates should be given for 18 - 24 months after denosumab discontinuation.

Table 2 Denosumab: clinical consequences related to the number of doses

One dose
No rebound effect.
As emergency (acute vertebral fracture) and decide 6 or 7 months later which treatment to use.
One or two doses followed by a bisphosphonate give good BMD results.
Two to six doses
The rebound effect is less severe.
More than six doses
The rebound effect is more severe.
The risk of missing a dose or of a delay of more than six months between two doses is increased.
Risk of early rebound effect (after 5 months).
Risk of multiple vertebral fractures during the rebound effect increases with duration of treatment.

Lamy O, Everts-Graber J, Gonzalez Rodriguez E. Aging Clin Exp Res. 2025. Everts-Graber J, et al. Bone 2022

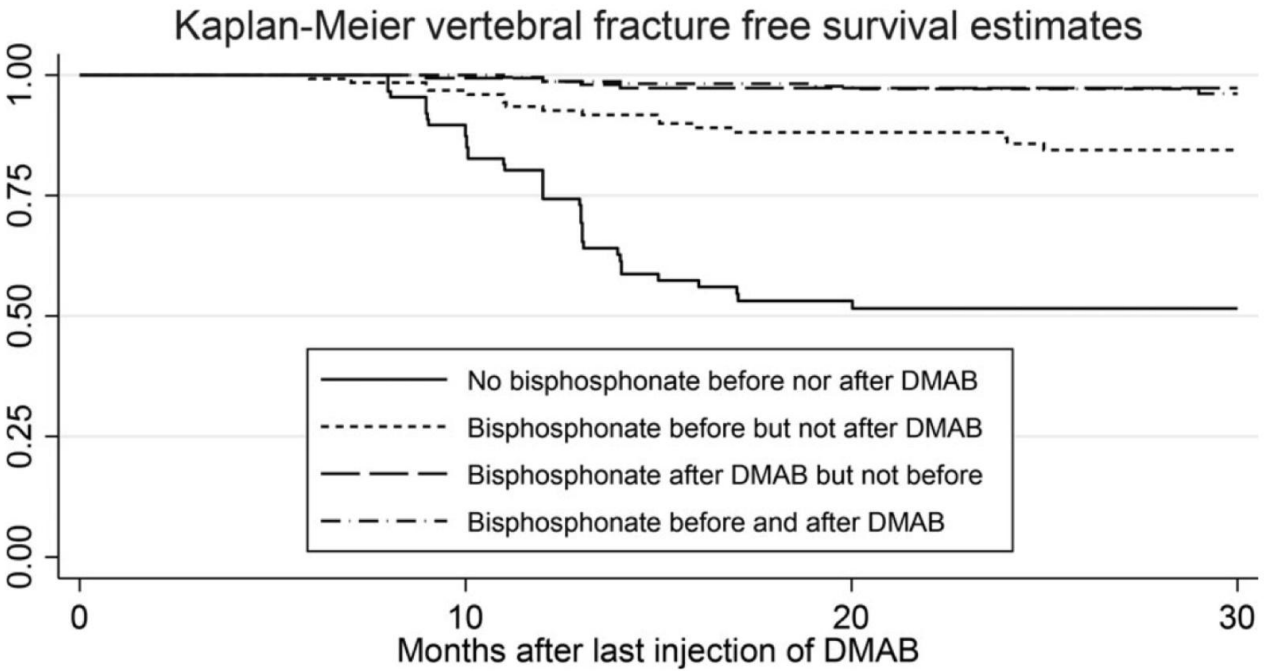
Fractures vertébrales après l'arrêt du Denosumab
Swiss denosumab study

797 femmes

82 femmes (**10.3%**)

215 FxV,
moyenne 2.6 FxV

Mediane: 12 mois



Burckhardt P. J Bone Miner Res 2021

Maintenance of bone resorption markers in the low premenopausal range during the year following denosumab discontinuation is associated to bone density preservation. The ReoLaus study

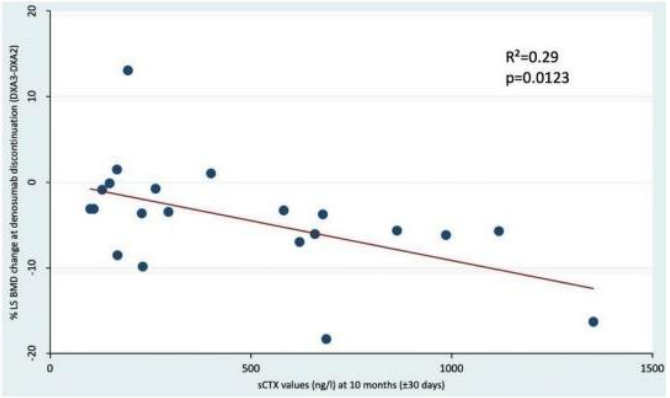
Giovanni Liebich [a], Olivier Lamy [b,c], Bérengère Aubry-Rozier [b], Elena Gonzalez-Rodriguez [b,*]

Bone 2023

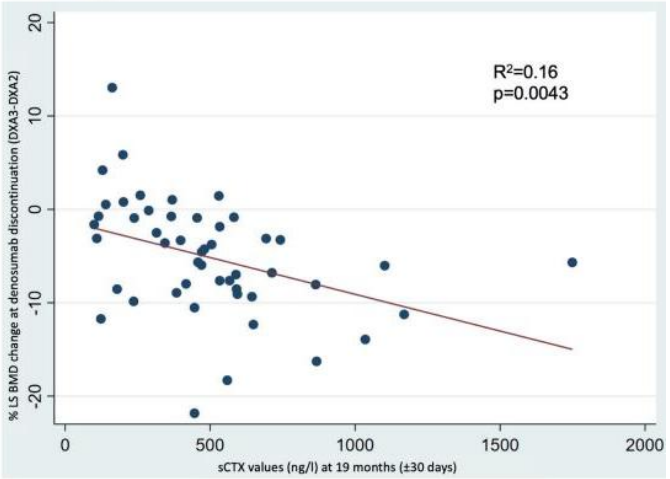
	Losers n=41 (min, max)	*Stable* n=22 (min, max)	p-value
Age at denosumab initiation (years)	61.6 ± 8.2 (40, 81)	69.0 ± 8.7 (55, 85)	0.003
BMI at denosumab initiation (kg/m²)	23.2 ± 3.1 (16.5, 30.2)	24.5 ± 3.9 (18.7, 35.6)	0.21
BP before denosumab initiation	6 (14.6%)	6 (27.3%)	0.22
Number of denosumab injections	8.5 ± 2.6 (3, 14)	6.8 ± 2.4 (2, 10)	0.014
T-score values at LS (SD)			
DXA 1	-3.03 ± 0.98 (-4.7, -0.5)	-2.08 ± 1.10 (-3.8, -0.4)	0.002
DXA 2	-2.07 ± 1.14 (-4.0, -2.0)	-1.32 ± 1.14 (-2.9, -1.4)	0.017
DXA 3	-2.61 ± 1.13 (-4.5, -1.7)	-1.26 ± 1.20 (-3.0, -1.5)	< 0.001
% BMD change (DXA3-DXA2)			
LS	-8.1 ± 4.3 (-21.8, -3.1)	0.8 ± 3.4 (-2.8, 13.0)	
TH	-4.2 ± 4.0 (-17.3, -2.6)	-0.1 ± 3.5 (-5.8, 7.4)	< 0.001
FN	-3.6 ± 5.7 (-27.3, -8.7)	-1.6 ± 3.8 (-9.0, 4.8)	0.10
sCTX (ng/l)			
before denosumab initiation	615 ± 159 (291, 987)	446 ± 269 (16, 1060)	0.037
during denosumab treatment	41 ± 21 (10, 120)	78 ± 89 (17, 412)	0.13
7 months (±30d) after last denosumab	290 ± 280 (44, 1031)	264 ± 170 (50, 701)	0.72
10 months (±30d) after last denosumab	590 ± 372 (100, 1352)	221 ± 101 (129, 401)	0.007
19 months(±30d) after last denosumab	598 ± 324 (109, 1749)	293 ± 157 (100, 582)	< 0.001

Norme femmes premenopausées CTX < 573

a) Correlation between serum crosslaps (sCTX) values (ng/l) 10 months (±30 days) after last denosumab, and % LS BMD change after denosumab discontinuation (DXA3-DXA2)



b) Correlation between serum crosslaps (sCTX) values (ng/l) 19 months (±30 days) after last denosumab, and % LS BMD change after denosumab discontinuation (DXA3-DXA2)

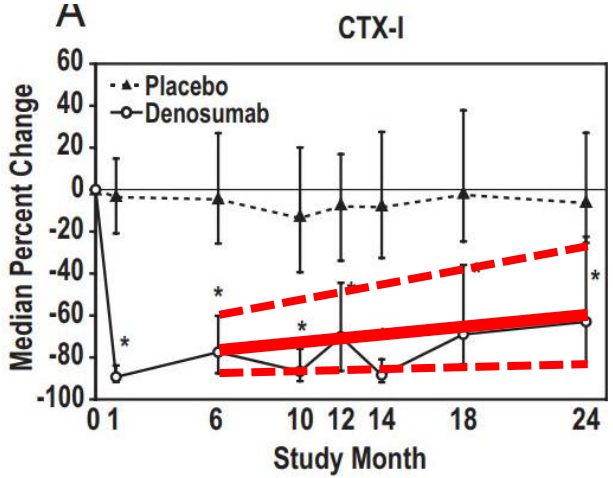


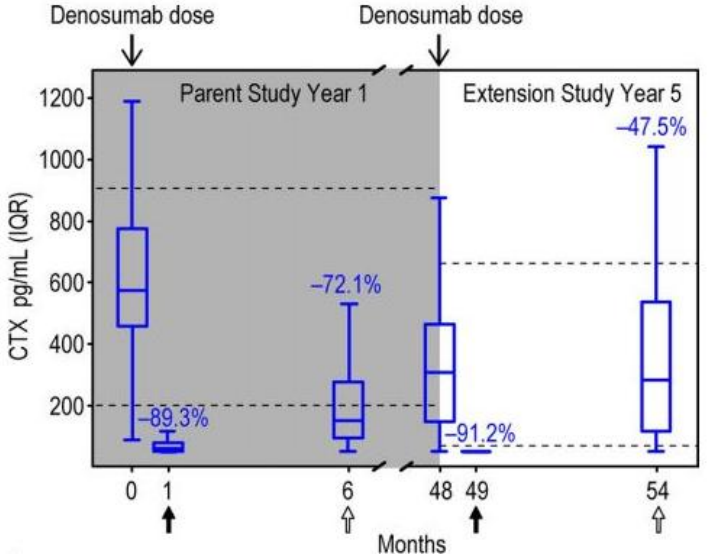
Effet rebond précoce ?

Cas rapportés (et vécus) de Fx vertébrales survenant entre le 5ème et 6ème mois post dernière dose de Denosumab

1. Suivre CTX 1x/an
2. Injections strictes chaque 6 mois (ttt > 3 ans)
3. Suivi DXA 1x/2 ans
4. Injections aux 5 mois si CTX élevés

Bone H. JCEM 2008. Miller P. JCEM 2011



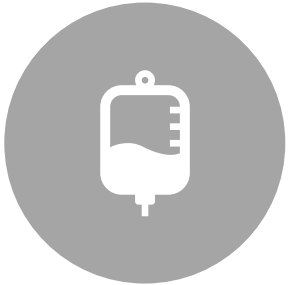


Denosumab : séquence de traitement idéale ?

1. Débuter avec alendronate ou zolédronate pour 2 ans (1 an)
2. Denosumab limité à 3 - 4 ans
3. Alendronate 4 mois après la dernière injection de denosumab
4. CTX à 7 mois, puis chaque 2 mois
5. Zoledronate si CTX > 2/3 limite sup de la norme préménopause
6. CTX chaque 3 mois
7. Zolédronate à répéter si cette cible n’est pas maintenue
8. Longue pause 24 à 30 mois après dernier denosumab

« école lausannoise 2022 »

Les traitements anaboliques osseux «*anabolic first*»



TRAITEMENT DE L'OSTÉOPOROSE FRACTURAIRE*

ROMOSOZUMAB

30 - 75% FX

S-CUT 1X/MOIS X 1 AN

TERIPARATIDE

20 - 80% FX

S-CUT 1X/J X 2 ANS

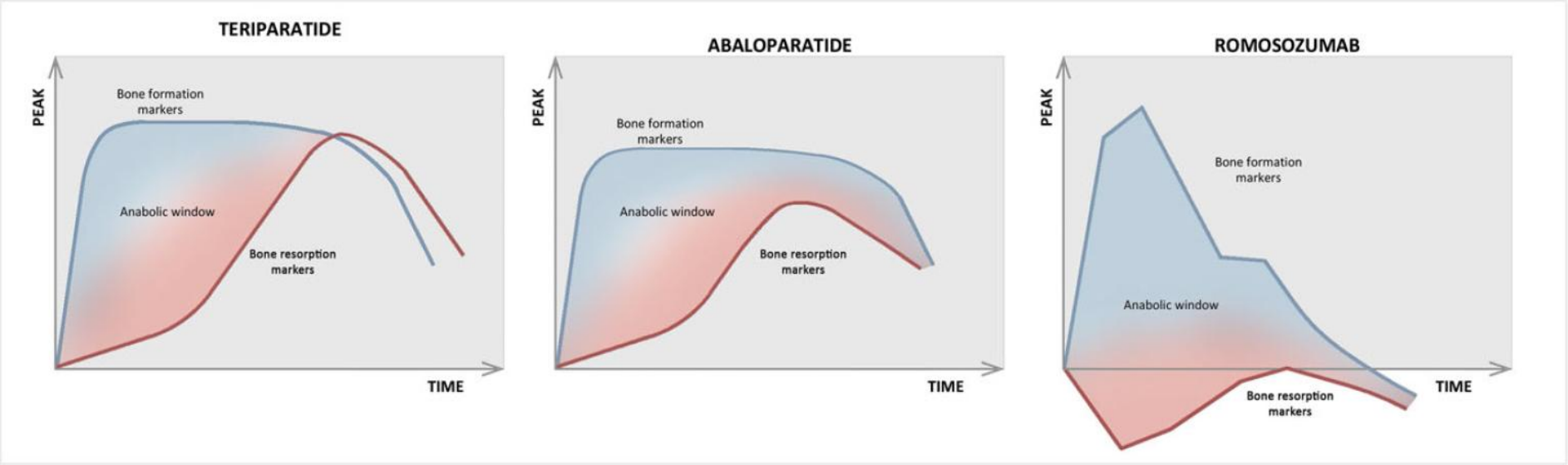
ABALOPARATIDE

50 - 85% FX

S-CUT 1X/J X 1.5 AN

*Fx OP majeures : fémur, hanche, bassin, vertèbres, humérus proximal

Agents anaboliques : le concept de fenêtre anabolique



Adapté de Tabacco G. Br J Clin Pharmacol 2019

Bone forming agents for osteoporosis: how to choose

For patients at very high risk of fractures (most of whom already have osteoporotic fractures).

Romosozumab, Teriparatide, and Abaloparatide are very efficacious on lumbar spine BMD and TBS.

Romosozumab and Abaloparatide are more efficacious than Teriparatide on cortical BMD.

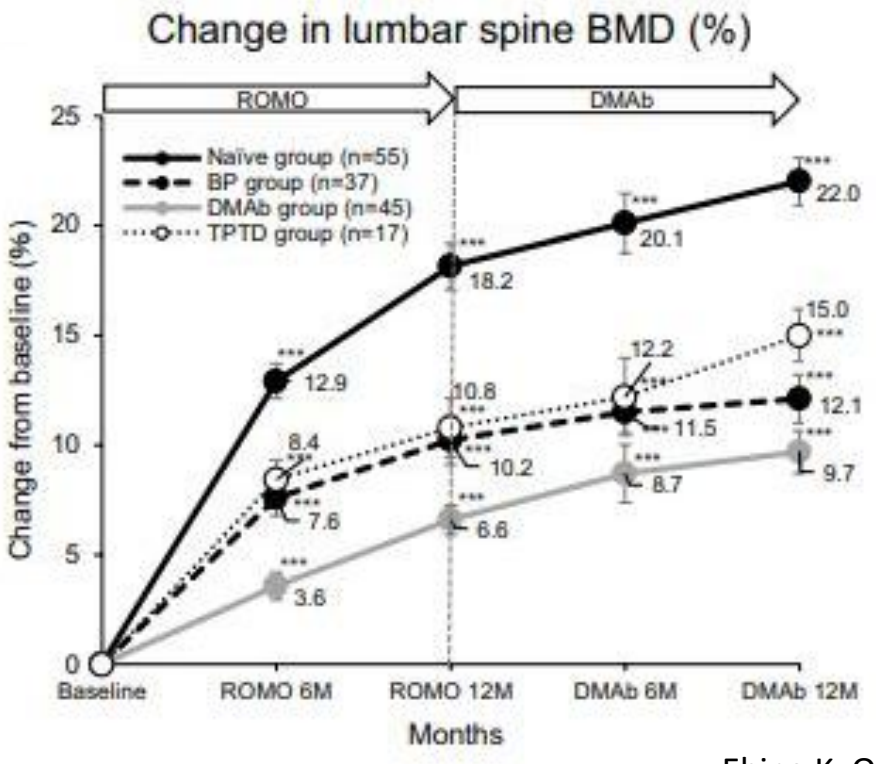
All are more efficacious than antiresorptive treatment to decrease the vertebral fracture risk ($\geq$ 70%).

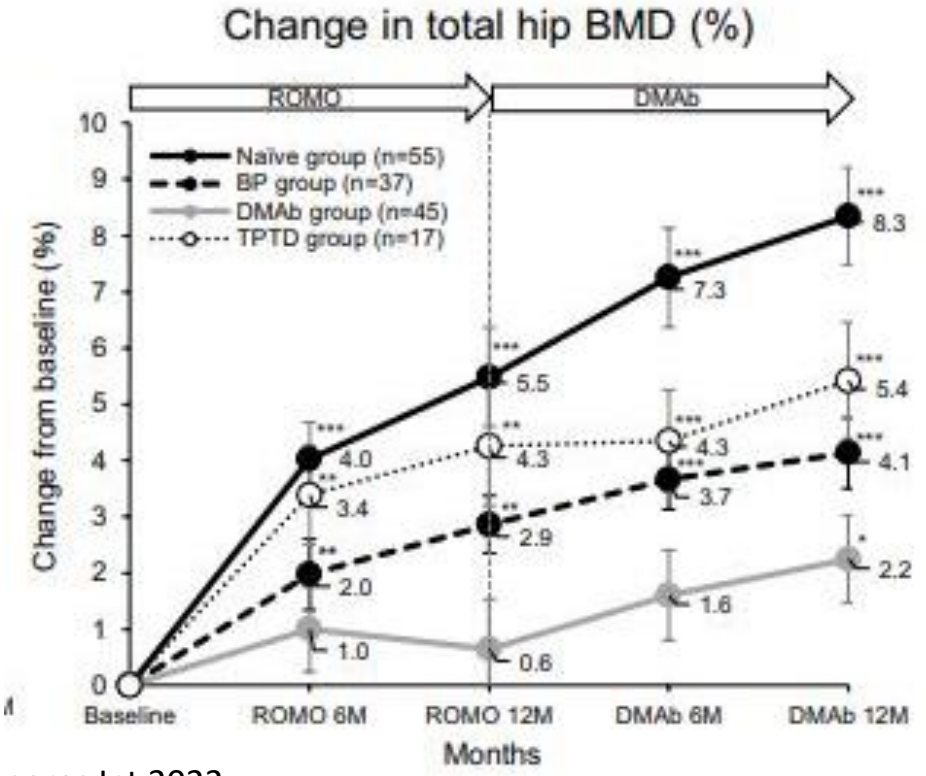
The duration of use is limited: teriparatide 24 months, abaloparatide 18 months, romosozumab 12 months.

After anabolic treatment, an antiresorptive agent should be given for at least 1 to 2 years.

Ideally anabolic should be given as first-line treatment. BMD gain is reduced, if given as second line.

Effects of prior osteoporosis treatment on the treatment response of romosozumab followed by denosumab in patients with postmenopausal osteoporosis





Ebina K. Osteoporos Int 2022

Bone forming agents for osteoporosis: contraindications and limitatio

Specific contraindications :

CV diseases for Romosozumab, cancer for Teriparatide, (Abaloparatide ?)

Specific reimbursement conditions :

- **Abaloparatide and Romosozumab** are reimbursed as ***first line treatment*** :

  One major OP Fx and T-score $\leq$ -3.5 SD

  Two major OP Fx

- **Teriparatide** is reimbursed as ***second line treatment*** :

  Vertebral Fx after at least 6 months treatment with antiresorptive

  Glucocorticoid-induced osteoporosis : failure of treatment

LES SÉQUENCES DE TRAITEMENT DE L'OSTÉOPOROSE

ANTIRÉSORBEUR
ANTIRÉSORBEUR

DMAB - BP
BP - DMAB - BP

ANABOLIQUE
ANTIRÉSORBEUR

Le plus efficace «anabolic first»

ANTIRÉSORBEUR
ANABOLIQUE
ANTIRÉSORBEUR

Fx majeure sous antirésorbeur (complexité, efficacité diminuée ?)

Les séquences de traitement en ostéoporose

Denosumab → Bisphosphonates

Bisphosphonates → Denosumab → Bisphosphonates

Bisphosphonate → Tériparatide 2 ans → Bisphosphonates

Denosumab → Denosumab + Tériparatide 2 ans → Denosumab 1 an → Bisphosphonates

Romosozumab 1 an (Abaloparatide 1.5 an) → Bisphosphonates

Romosozumab 1 an (Abaloparatide 1.5 an) → Denosumab → Bisphosphonates

Fracture sous traitement

Evaluer la fracture : localisation, mécanisme, temporalité

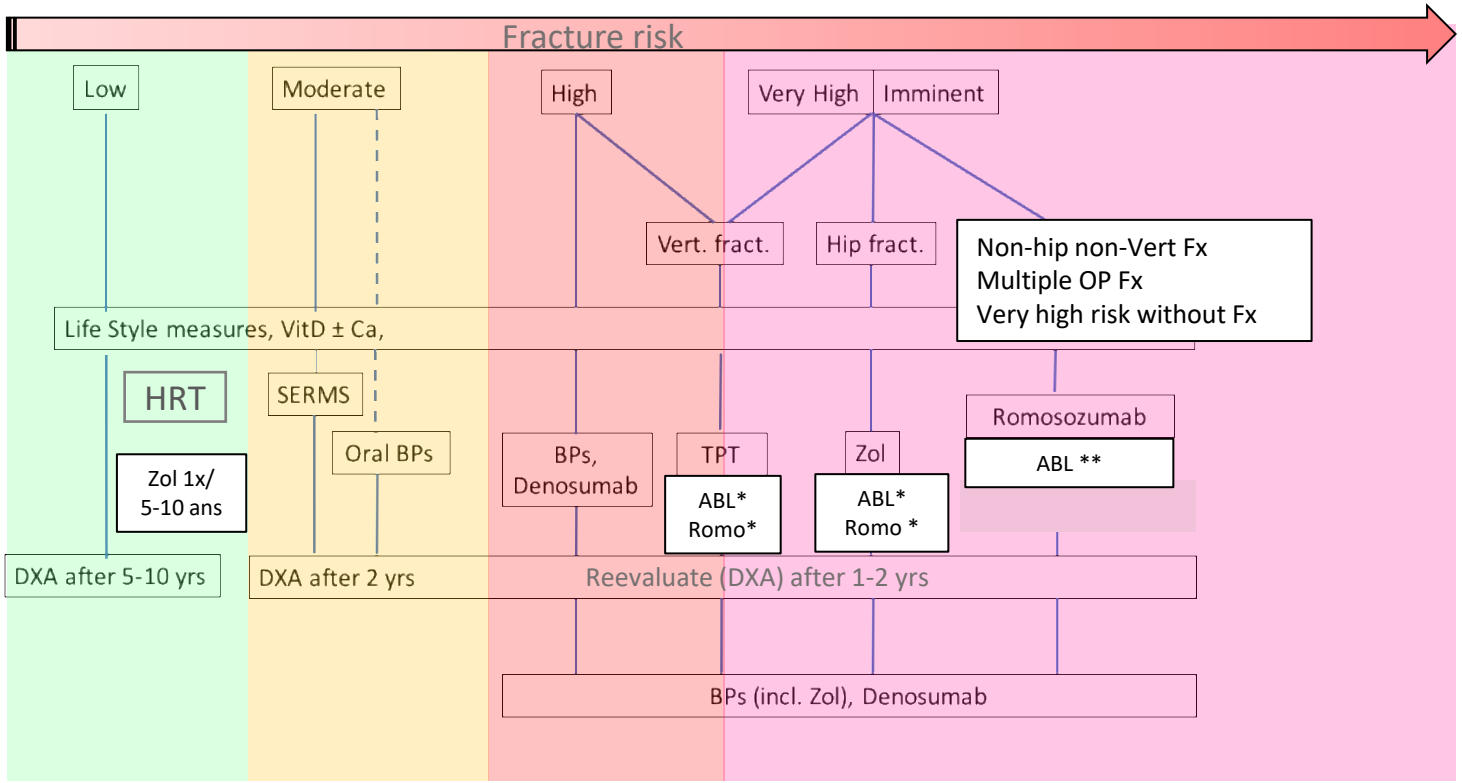
Bilan des causes secondaires et marqueurs du remodelage osseux

Sous bisphosphonate : à stopper et remplacer

Sous denosumab : le poursuivre et ajouter un anabolique

Sous anaboliques : les poursuivre et passer au denosumab à leur arrêt

Revised recommendations from the Swiss association against OP – Draft (proposal, ongoing work, 2026)



* Particularly if hip BMD < -2.5 T-score

** depending on the contraindications

Opportunity of first choice (reimbursement criteria)

Merci pour votre attention

Lowest baseline T-score that permits > 50% of women to achieve a T-score > −2.5 in approximately 3 yr.

	Total Hip	Lumbar Spine
Alendronate	−2.7	−3.0
Denosumab	−2.8	−3.1
Romosozumab/Alendronate	−2.9	−3.5
Abaloparatide/Alendronate	−2.9	−3.5
Romosozumab/Denosumab	−3.1	−3.7

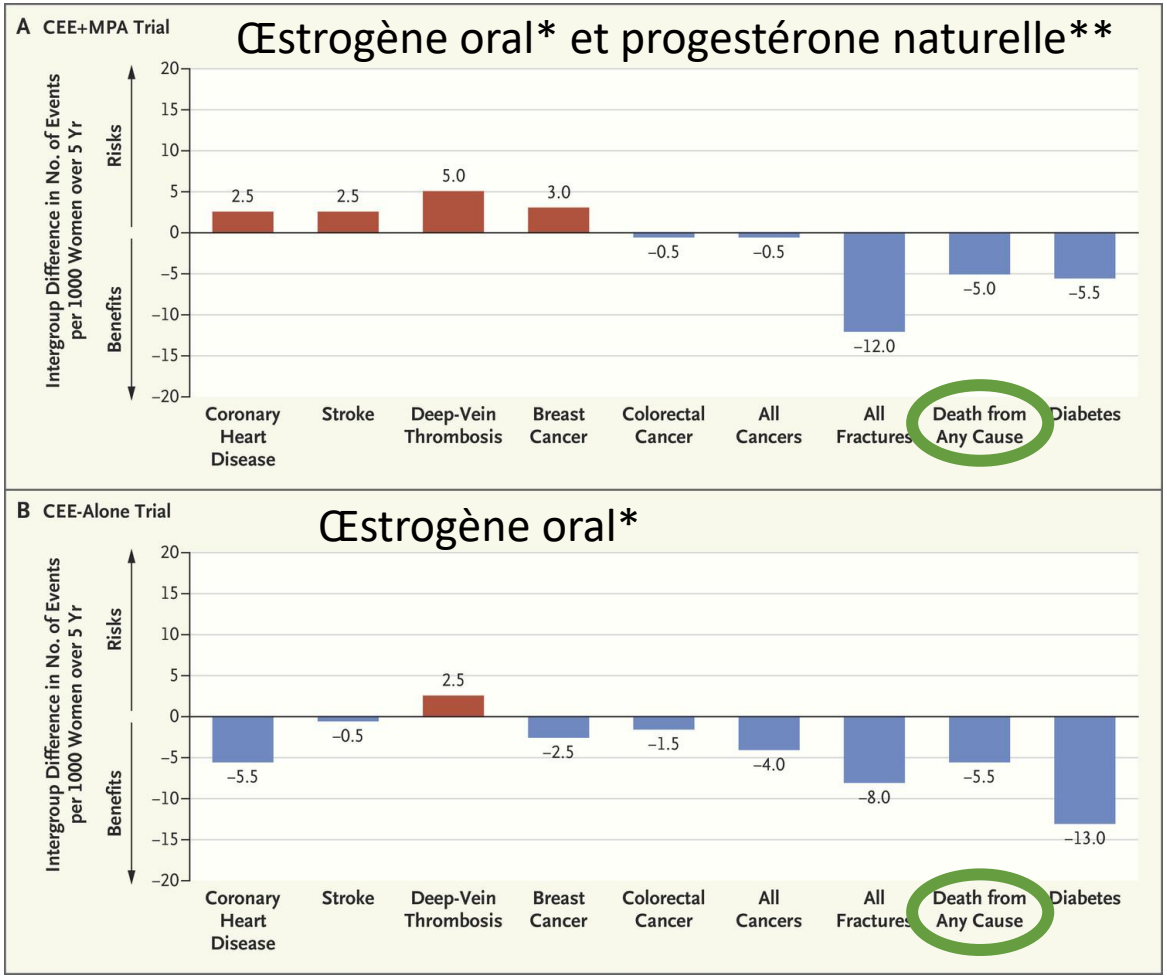
Cosman F. JBMR 2024

Traitement hormonal de la ménopause

1000 femmes ttt 5 ans
50 - 59 ans
WHI

* Œstrogènes équins conjugués Prémarin®

** Acétate de médroxyprogestérone DepoProvera ®



Manson JE.NEJM 2016