Glukokortikoide Bağlı Osteoporoz

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25.11.2024

İSTANBUL ÜNİVERSİTESİ
CERRAHPAŞA

Akış

Glukokortikoide Bağlı Osteoporoz (GBOP)

- GBOP gelişmesi
- ACR 2022 kılavuzu önerileri
- GBOP için risk grupları
- GBOP’na yaklaşım ve tedavi
- Diğer kılavuzlar: JSO, NOGG, BBC, TEMD

ACR 2022
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2023

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2022 American College of Rheumatology Guideline for the Prevention and Treatment of Glucocorticoid-Induced Osteoporosis

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Revised July 9, 2023

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A strong recommendation was made to use oral bisphosphonates (BPs) over no treatment for adults ≥40 years receiving long-term GCs, at high and very high risk for fracture, based on available fracture data in GIOP populations. Other agents including intravenous BPs, PTH/PTHrP, and denosumab (DEN) are also options and are conditionally recommended given lack of fracture prevention data in GIOP populations. For adults at high risk, we conditionally recommended DEN or PTH/PTHrP over BP. For adults at very high risk, we conditionally recommended PTH/PTHrP over antiresorptives (BP, DEN). Raloxifene (RAL) and romosozumab (ROM) may be used in selected patients, after careful consideration of potential harms including thrombosis, stroke, and cardiovascular events.

Table 1: Definitions of selected terms used in the recommendations and upgraded position statements for GIOP

Term	Adults ≥40 years of age	Adults <40 years of age
Major osteoporotic fracture (MOF)	Non-traumatic or pathological fractures of the spine, hip, wrist, or humerus	Non-traumatic or pathological fractures of the spine, hip, wrist, or humerus
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GUIDELINE

The 2023 Guidelines for the management and treatment of glucocorticoid-induced osteoporosis

Yoshiya Tanaka[1] · Satoshi Soen[2] · Shintaro Hirata[3] · Yosuke Okada[4] · Saeko Fujiwara[5] · Ikuko Tanaka[6] · Yuriko Kitajima[7] · Takuo Kubota[8] · Kosuke Ebina[8,10] · Yuichi Takashi[11] · Reiko Inoue[12] · Mika Yamauchi[13] · Naoaki Okubo[1] · Masanobu Ueno[1] · Yasuhisa Ohata[8] · Nobuaki Ito[14,15] · Keiichi Ozono[8] · Hisanori Nakayama[16] · Masakazu Terauchi[17] · Sakae Tanaka[18] · Seiji Fukumoto[19]

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Abstract
Introduction Although synthetic glucocorticoids (GCs) are commonly used to treat autoimmune and other diseases, GC induced osteoporosis (GIOP) which accounts for 25% of the adverse reactions, causes fractures in 30–50% of patients, and markedly decreases their quality of life. In 2014, the Japanese Society for Bone and Mineral Research (JSBMR) published the revised guidelines for the management and treatment of steroid-induced osteoporosis, providing the treatment criteria based on scores of risk factors, including previous fractures, age, GC doses, and bone mineral density, for patients aged ≥18 years who are receiving GC therapy or scheduled to receive GC therapy for ≥3 months.
Materials and methods The Committee on the revision of the guidelines for the management and treatment of GIOP of the JSBMR prepared 17 clinical questions (CQs) according to the GRADE approach and revised the guidelines for the management and treatment of GIOP through systematic reviews and consensus conferences using the Delphi method.
Results Bisphosphonates (oral and injectable formulations), anti-RANKL antibody teriparatide, eldecalcitol, or selective estrogen receptor modulators are recommended for patients who has received or scheduled for GC therapy with risk factor scores of ≥3. It is recommended that osteoporosis medication is started concomitantly with the GC therapy for the prevention of fragility fractures in elderly patients.
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Keywords Glucocorticoid · Osteoporosis · Glucocorticoid-induced osteoporosis · Fracture · Treatment

Introduction

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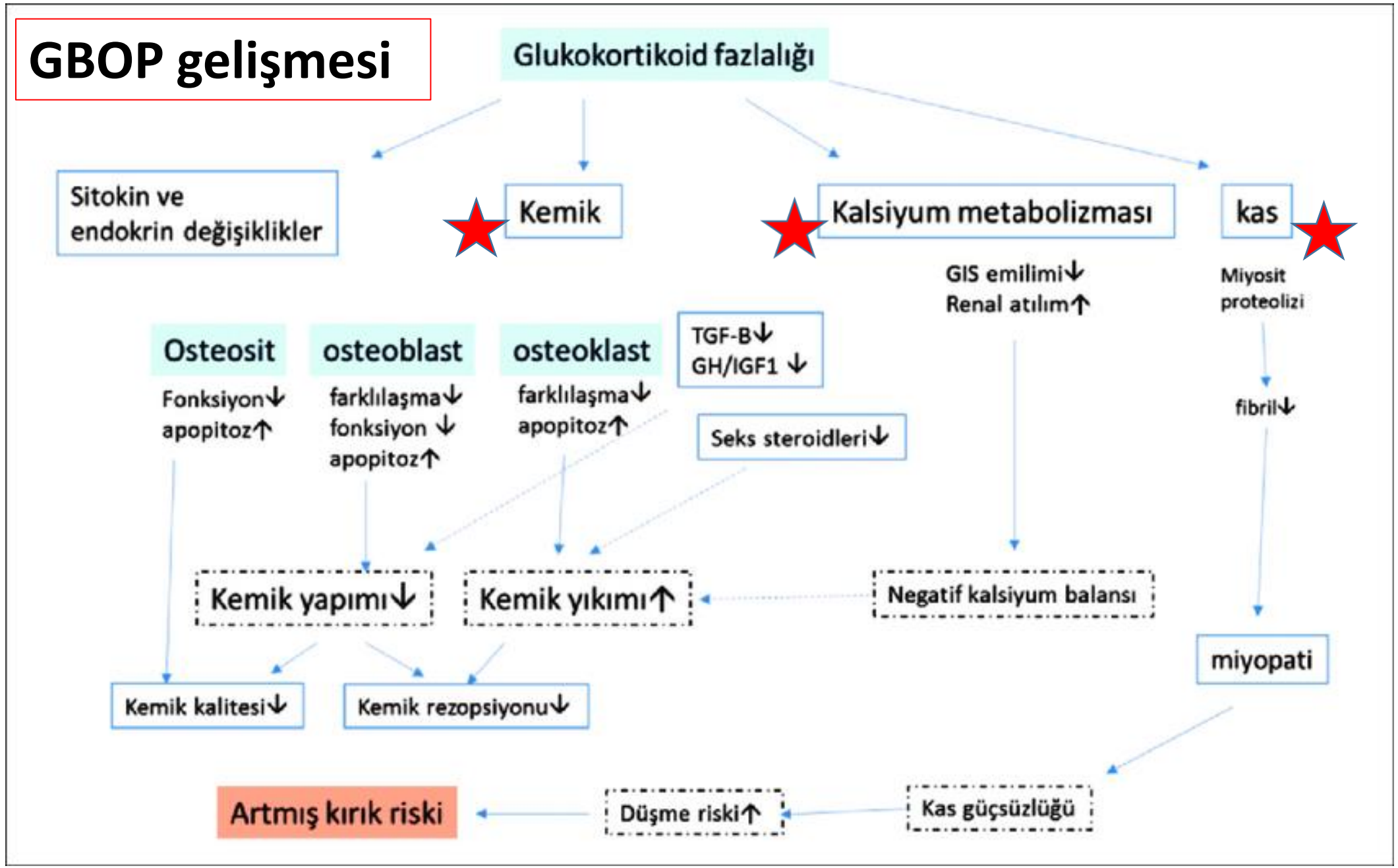
Abnormal bone metabolism induced by GCs is called GC-induced osteoporosis (GIOP). It is common, accounts for 25% of adverse drug reactions, and affects 0.7–1.2% of adults [4, 5]. GCs inhibit mesenchymal stem cell differentiation into osteoblasts and induce osteoblast and osteocyte apoptosis, inhibiting bone matrix production and then reducing bone mass and quality [1–3]. Simultaneously, GCs, directly and indirectly, stimulate osteoclast maturation and activation. Consequently, GCs rapidly reduce bone quality as well as quality and osteoporotic changes rapidly progress at 3–6 months after administration. GCs also cause fragility

Extended author information available on the last page of the article

GBOP 3-6 ay içinde gelişir

GBOP Dünya'da %1 - 1,2
GBOP'da %30-50 kırık oluşumu

GBOP gelişmesi

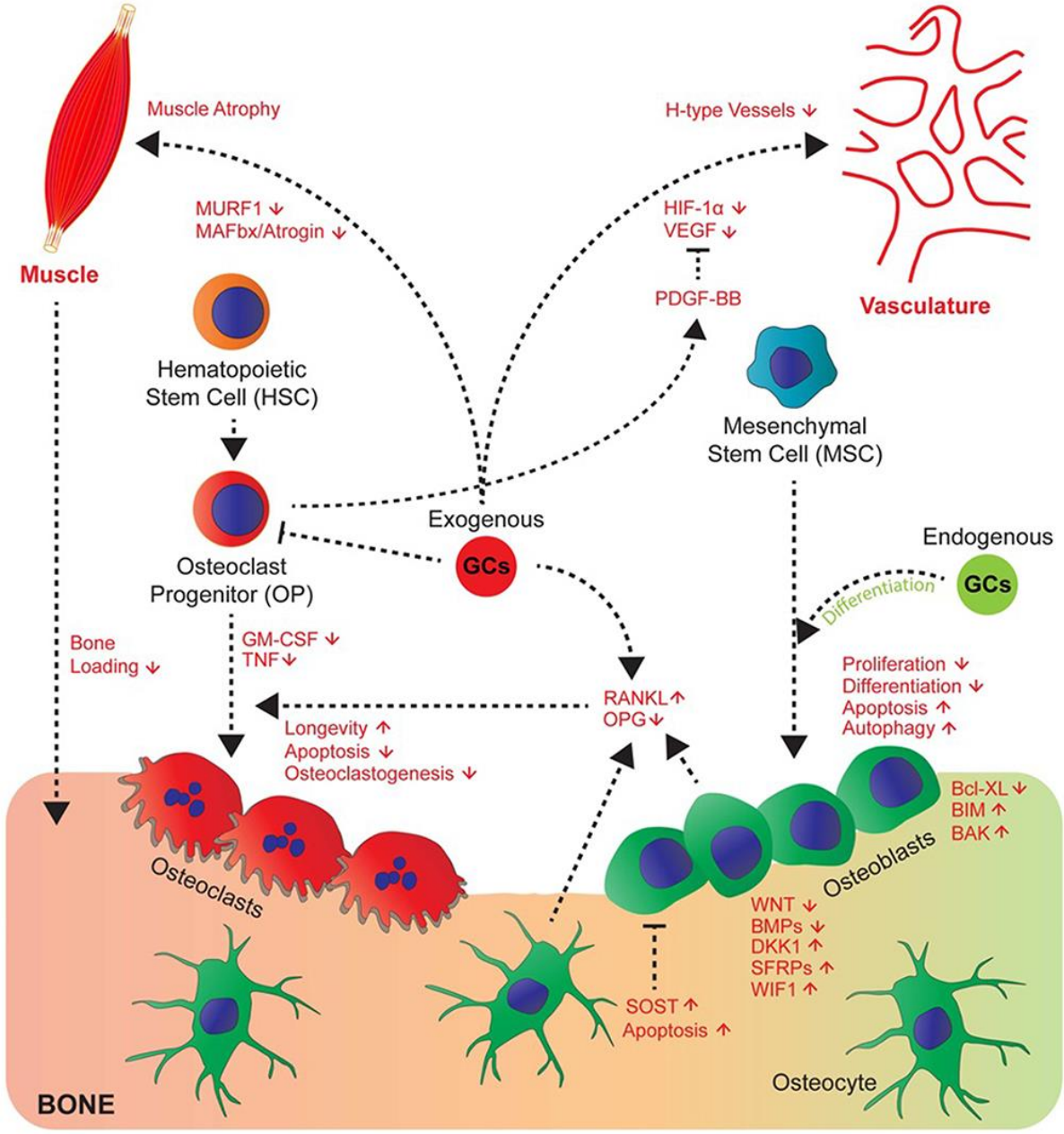


GK’lerin etkileri

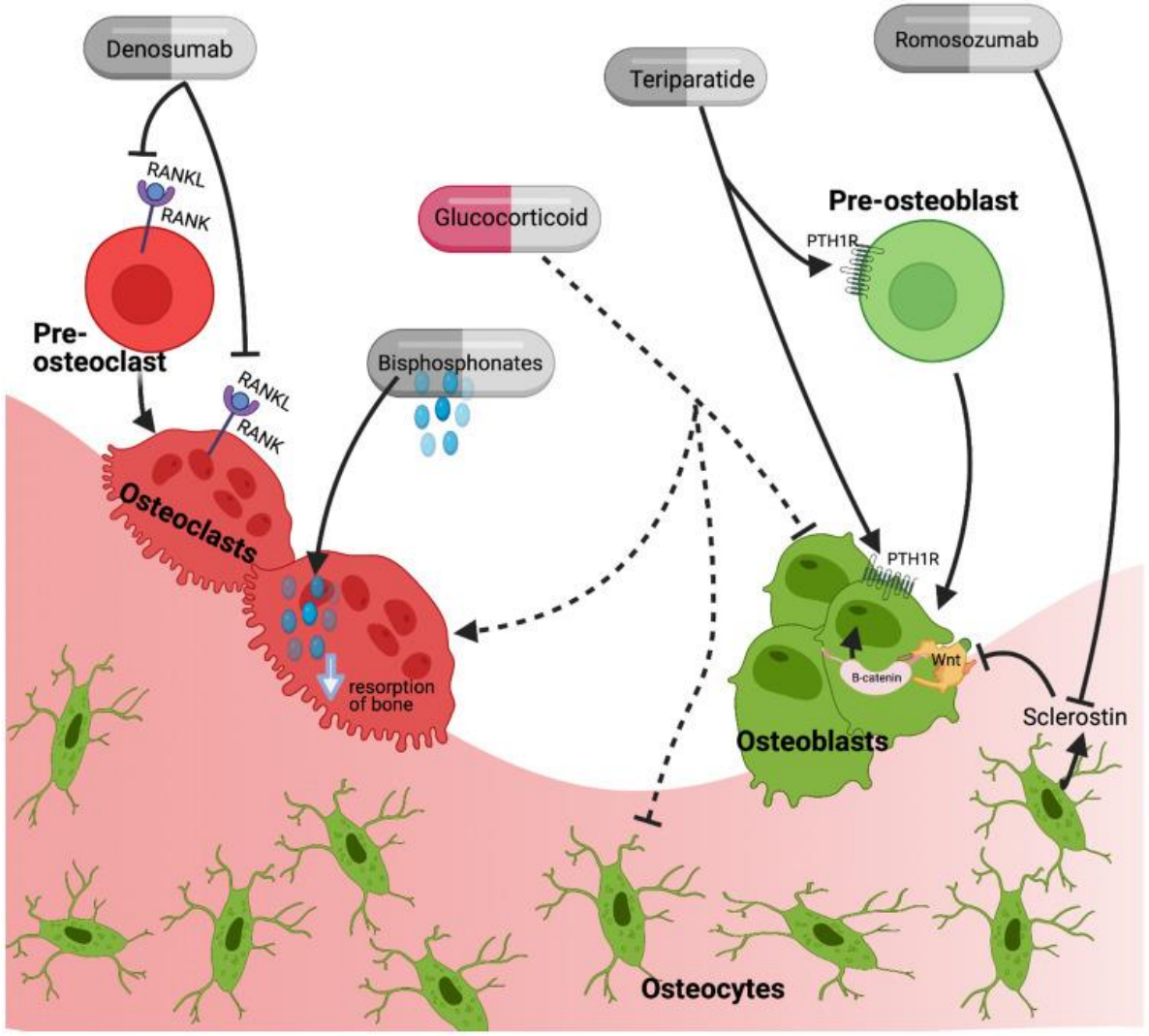
Endojen GK osteoblast diferensiyasyonunu artırır

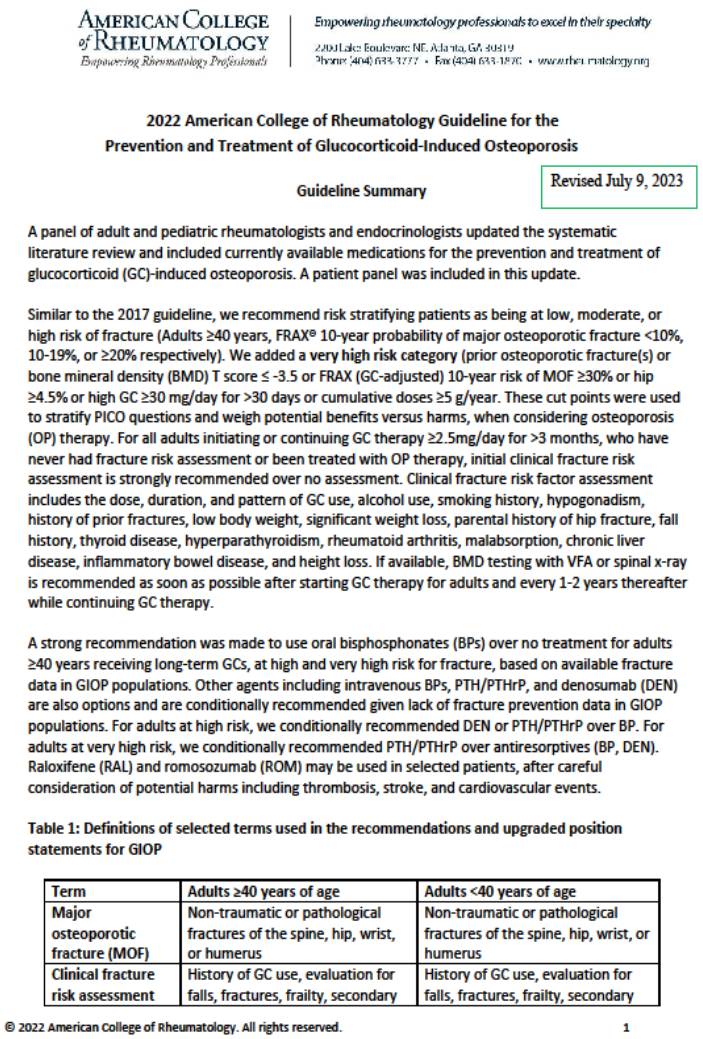
Eksojen GK osteoblast proliferasyonunu inhibe eder
RANKL/OPG oranı bozularak kemik rezorpsiyonu artar

+ Kas atrofisi indüklenir



GBOP tedavisinde kullanılan ajanların hedefleri





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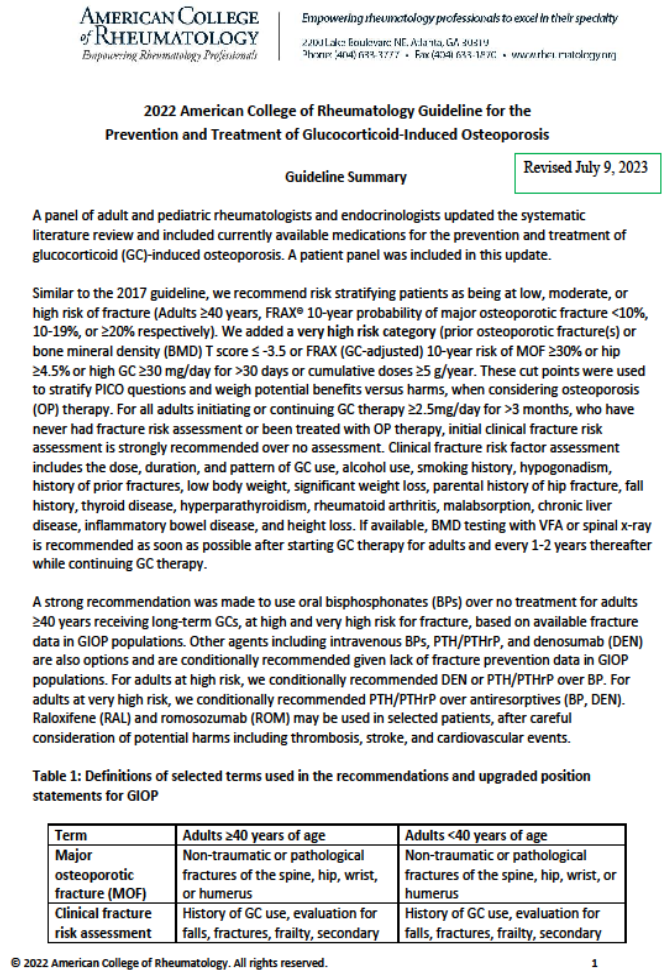
2022 ACR GBOP Koruma ve Tedavi Kılavuzu

2017 ACR kılavuzundan farkları

- Çok yüksek kırık riski kategorisi tanımlanması
- Osteoanabolik yeni tedavi ajanlarının, PTHrP (abaloparatid) ve Romozozumab eklenmesi
- Ardışık tedavi konusunda öneriler



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2022 ACR GBOP kılavuzu

Çok yüksek kırık riski

- Önceki frajilite kırığı veya
- T-skoru ≤-3,5 veya
- FRAX® 10-yıllık MOK riski ≥%30 veya
- KK riski ≥%4,5 veya
- Yüksek GK dozu ≥30 mg/gün >30 gün veya
- Kümülatif doz ≥5 g/yıl

	Frajilite kırığı **Vertebra, kalça, önkol, humerus**	**<40 yaş ve >40 yaş**
Klinik kırık riski değerlendirmesi	**GK kullanımı öyküsü** **Düşme**	

ACR 2022: **GK tedavi başlangıcında, ≥40 yaş erişkin**

≥2,5mg/gün, >3 ay süreyle GK tedavisi öngörülüyorsa

FRAX® ile kırık riski değerlendirilmesi ➡ **kuvvetli öneri**

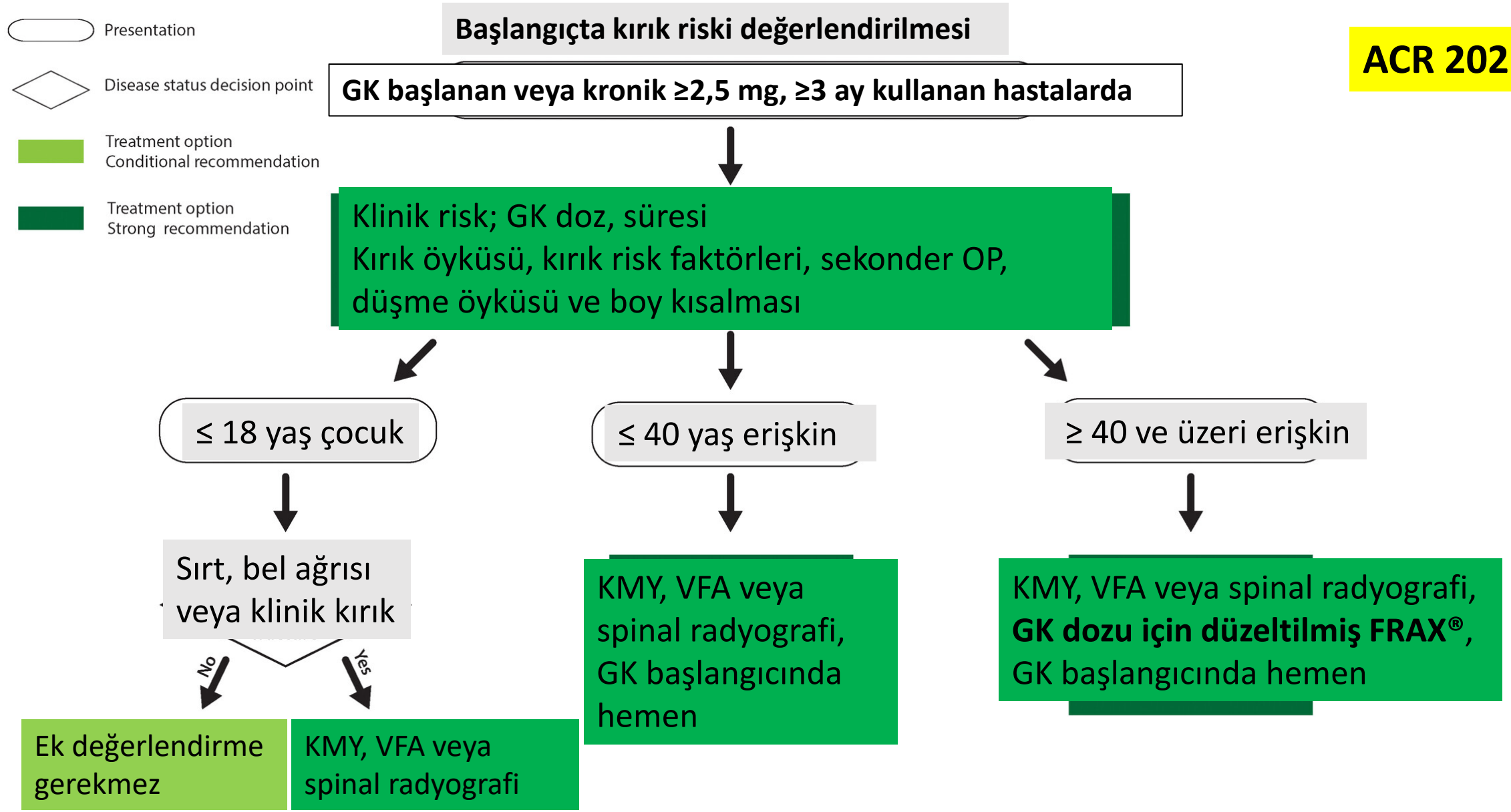
Majör kırık	Kalça kırığı	10-yıllık kırık olasılığı
<%10	<%1	düşük
%10-19	%1-3	orta
≥%20	≥%3	yüksek kırık riski
≥%30	≥%4,5	çok yüksek kırık riski ★

ACR 2022 GK tedavi başlangıcı

Klinik kırık riski faktörleri değerlendirilir

- FRAX® ≥40 yaş
- GK dozu, süresi, uygulama şekli
- Frajilite kırığı
- Düşük VKİ, kilo kaybı, boy kısalması
- Düşme
- Sekonder OP: DM, hipogonadizm, RA, malabzorpsiyon, tiroid, hiperparatiroid, kronik karaciğer, enflamatuvar barsak hastalığı

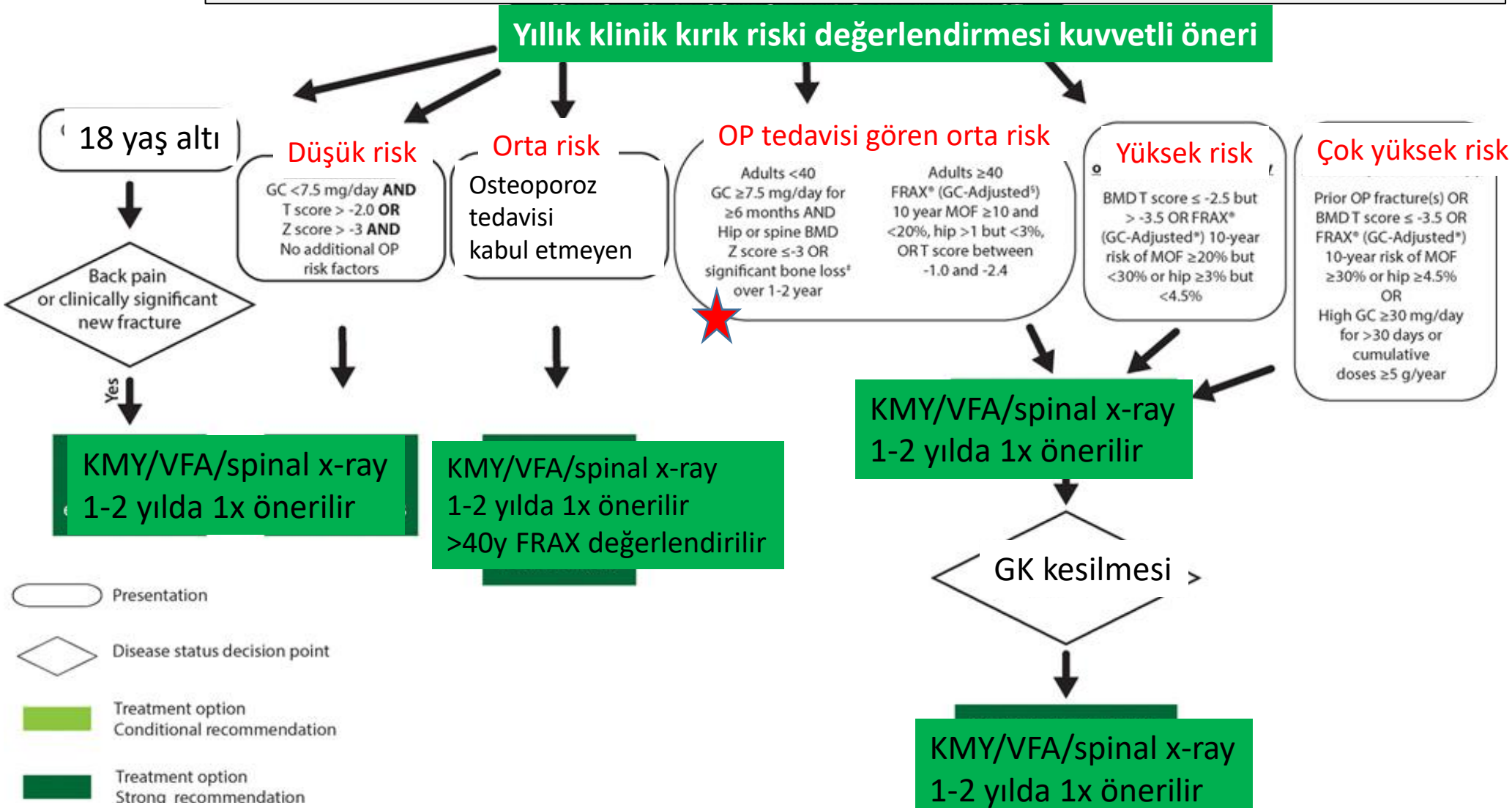
Başlangıçta KMY ve mümkünse VFA veya spinal radyografi önerilir



ACR 2022

GK için düzeltilmiş FRAX® hesaplaması:
GK dozu ≥ 7,5 mg/g ise MOK riski X 1,15, KK riski X 1,2 olarak hesaplanır

Kırık riskinin tekrar değerlendirilmesi: GK kronik ≥2,5 mg, >3 ay kullanımında



FRAX® ile GK'e göre düzeltilmiş kırık riski değerlendirmesi > 40 yaş önerilir

Orta dereceli risk için tedavi önerilir, hasta kabul etmeyebilir

★ **Anlamlı kemik kaybı**; en küçük anlamlı düşüş (least significant change), kullanılan DXA gerecine göre, tipik olarak **1-2 yılda %3-5 kadar**

ACR 2022: GBOP başlangıç tedavisi

- **Oral BF:** ≥40 yaşında, uzun dönem GK kullanımı için seçilebilir (kuvvetli öneri)
- **Orta derecede kırık riskinde**: Oral/İV BF, denosumab, PTH/PTHrP seçilebilir (şartlı öneri)
- **Yüksek kırık riskinde:** Denosumab veya PTH/PTHrP, BF'lara tercih edilir, romozosumab seçilebilir
- **Çok yüksek kırık riskinde:** Anabolik tedaviler PTH/PTHrP, romozosumab, antiresorptiflere tercih edilir
- Raloksifen ve romosozumab bazı hastalarda seçilebilir, ancak potansiyel zararlar göz önünde bulundurulur (tromboz, stroke, KVS)

Başlangıç tedavisi – erişkinler için

Optimal kalsiyum (diyet ve destek) 1000-1200mg/g ve
Vit D alımı sağlanır (600-800 İÜ/g) - **Serum düzeyi > 30-50ng/ml**

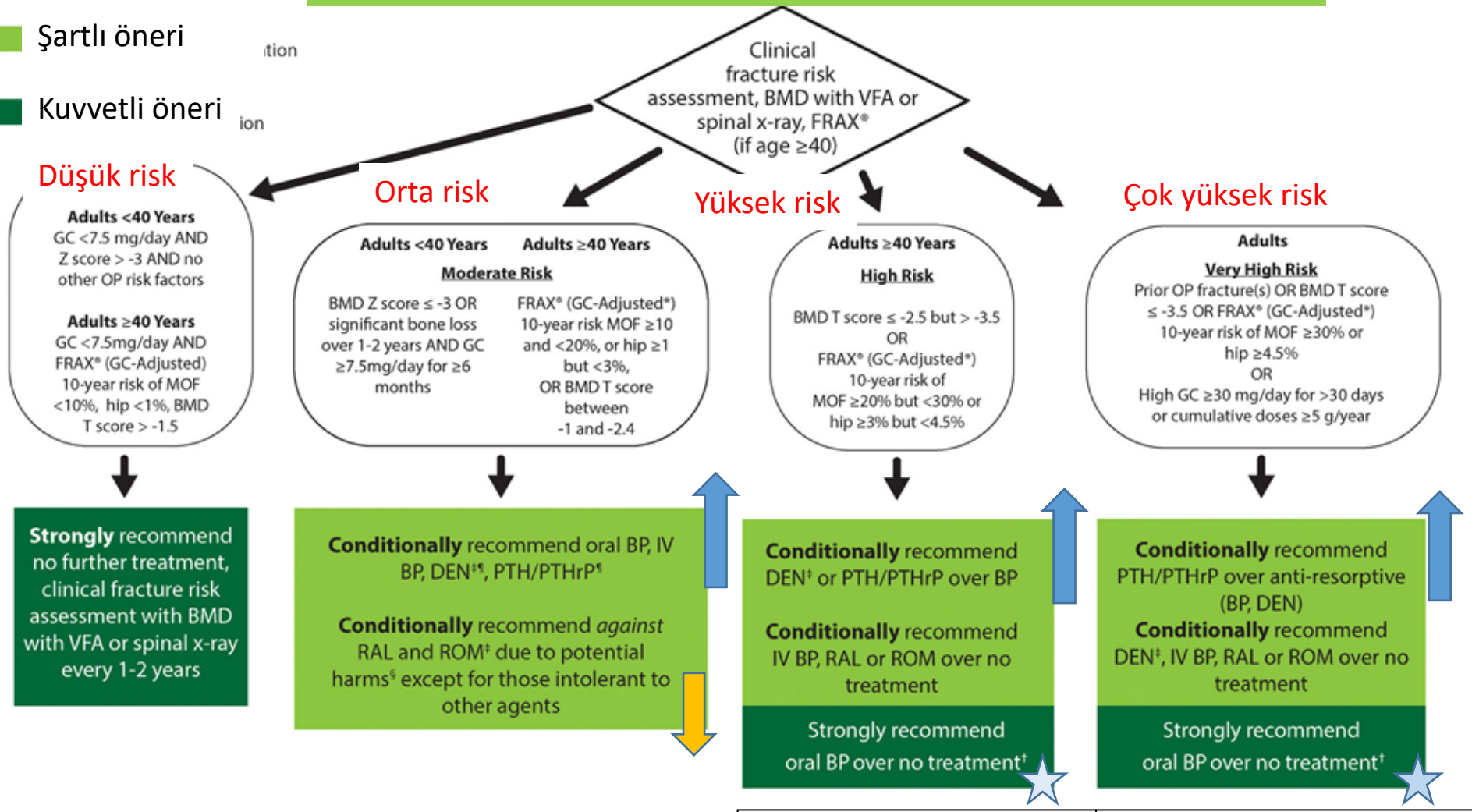
Presentation

Disease status decision point

Şartlı öneri

Kuvvetli öneri

GK < 7,5mg/gün

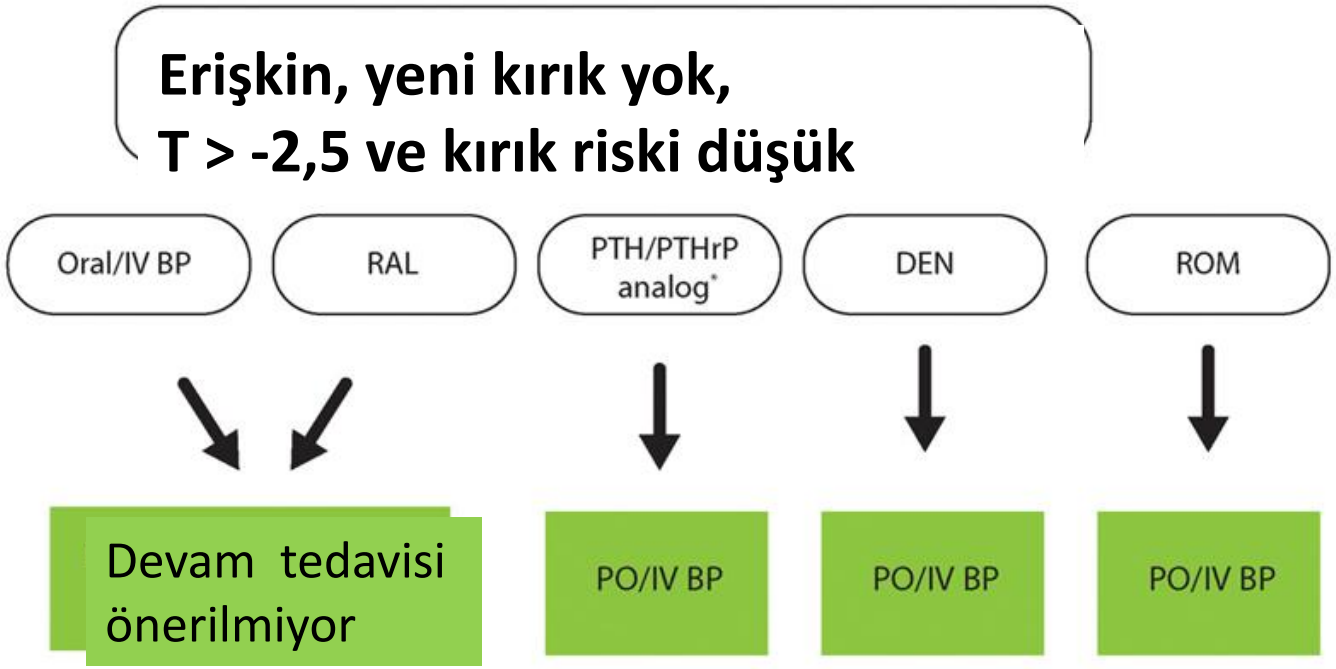


Doğurgan yaştaki kadınlarda doğum kontrolü önerilmeli ve son dozdan > 5 ay sonrasına kadar hamilelik önlenmeli

Diğer tedaviler uygun değilse oral BF	Diğer tedaviler uygun değilse oral BF

Ardışık OP tedavisi önerileri: GK tedavisi sonlandırılmasında veya OP tedavisi sonlandırılmasında

Şartlı öneri



Kırık etkinliği 18 ay devam edebilir; ancak antirezorptif oral/İV BF önerilir

Erişkin, kırık riski yüksek veya çok yüksek,
T-skoru ≤ -2,5 veya ≥ 12 ay OP tedavisinden sonra yeni kırık varlığında

Tedavi devam etmeli

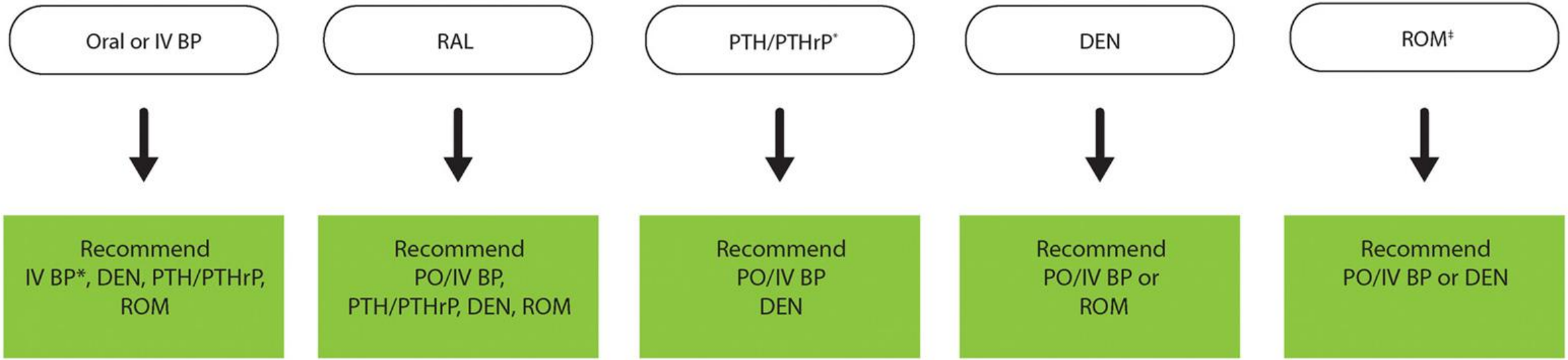
therapy or switch to IV BP, DEN†, PTH/PTHrP†, ROM†

Var olan tedavi değiştirilmez veya İV BF, Denosumab, PTH/PTHrP, Romozozumab'a geçilebilir

OP tedavisi başlangıcından ≥ 12 ay sonra frajilite kırığı oluşumunda tedavi önerileri

Initial osteoporosis treatment

Şartlı öneri



ACR kılavuzu 2022 ardışık tedavi önerileri

- Denosumab, teriparatid (PTH), PTHrP, veya romosozumab tedavilerinden sonra kemik kaybının önlenmesi için **OP tedavisi devam etmeli**
- Denosumab tedavisini takiben 1-2 yıl BF tedavisi kullanılmalı; denosumab'ın 2 veya daha fazla dozdan sonra kesilmesi hızlı kemik kaybı ve son dozdan 7-9 ay sonra yeni vertebral kırığa neden olabilir

  BF tedavisi denosumab'ın son dozundan 6-7 ay sonra önerilir
- **PTH/PTHrP** tedavisinden sonra oral veya İV BF veya denosumab ile devam edilebilir
- **Romozozumab** tedavisinden sonra oral / İV BF veya denozumab ile devam edilebilir

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GBOP için Japanese Society for Bone and Mineral Research (JSBMR) 2023 kılavuzu

GK tedavisi ≥ 3 ay öngörülen hastada
Risk faktörleri skoru ≥3 puan ise girişim önerir

- İleri yaş
- Geçirilmiş kırık
- GK dozu > 7,5 mg/gün
- Düşük KMY

Klinik sorunlar ve GBOP yönetimi ile tedavisi (17 soru)

✓**BF'ların GBOP tedavisindeki yeri nedir?**

BF'ların vertebral ve non-vertebral kırık etkinliği için kanıtlar var

Kanıt düzeyi (A) **Öneri düzeyi** (1) **Uzlaşı düzeyi** (9.0)

✓**GBOP'da vertebral kırık etkinliği açısından kullanılan ajanların etkileri farklı mı?**

Teriparatid ve denosumab, BF tedavisine göre daha etkili

Yüksek kırık riskinde teriparatid önerilir

Kanıt düzeyi (B) **Öneri düzeyi** (1) **Uzlaşı düzeyi** (8.0)

Prevention and treatment of glucocorticoid-induced osteoporosis - UpToDate.html

GBOP’da Kalsiyum ve Vitamin D desteklerinin yeri

Kronik GK kullanan tüm hastalarda veya GK tedavisi ≥3 ay planlanan hastalarda kalsiyum ve Vitamin D desteği önerilir (**öneri düzeyi 2B**)

- 1000 - 1200 mg/gün
- 800 İÜ/gün Vitamin D

Kanada Geriyatri &Romatoloji 2021

Open Access Rheumatology: Research and Reviews

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REVIEW

Understanding and Managing Corticosteroid-Induced Osteoporosis

GBOP

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Abstract: Glucocorticoids are effective immunosuppressants used in a wide variety of diseases. Their use results in secondary osteoporosis in about 30–50% of chronic glucocorticoid users. Glucocorticoids cause a rapid decline in bone strength within the first 3–6 months mostly due to increased bone resorption by osteoclasts. This is followed by a more gradual loss of bone partly due to decreased osteoblastogenesis and osteoblast and osteocyte apoptosis. The loss of bone strength induced by glucocorticoids is not fully captured by bone mineral density measurements. Other tools such as the trabecular bone score and advanced imaging techniques give insight into bone quality; however, these are not used widely in clinical practice. Glucocorticoid-induced osteoporosis should be seen as a widely preventable disease. Currently, only about 15% of chronic glucocorticoid users are receiving optimal care. Glucocorticoids should be prescribed at the lowest dose and shortest duration. All patients should be counselled on lifestyle measures to maintain bone strength including nutrition and weight-bearing exercise. Pharmacological therapy should be considered for all patients at moderate to high risk of fracture as there is evidence for the prevention of bone loss and fractures with a favourable safety profile. Oral bisphosphonates are the current mainstay of therapy, whereas osteoanabolic agents may be considered for those at highest risk of fracture.

Keywords: glucocorticoid-induced osteoporosis, bone mineral density, fracture, bisphosphonate

Introduction

Synthetic glucocorticoids are prescribed in a wide range of diseases including rheumatological, pulmonary, gastrointestinal, various malignancies and following organ transplantation. The life-saving benefit that these medications provide is not without a long list of adverse effects. One of the most serious is the effect on the skeletal system where glucocorticoids can cause osteoporosis. Glucocorticoid-induced osteoporosis (GIOP) is the most common cause of secondary osteoporosis.[1] Despite this well-known adverse effect, many patients are not monitored or treated appropriately.[2]

Osteoporosis is characterized by changes in bone architecture, leading to a decrease in bone mineral density (BMD) and an increased risk of fracture. In GIOP, the increased risk of fracture cannot be fully explained by changes in BMD. Changes in bone quality also seem to play a large role.[3]

This will be a review of the pathophysiology and management of glucocorticoid-induced osteoporosis.

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Epidemiology

Worldwide about 1% of the adult population has been treated with long-term glucocorticoids, defined as a minimum of 3 months of consecutive use.[4,5] Of this

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- **Aktif vitamin D analogları** (kalsitriol ve alfakalsidol), inaktif vitamin D3 ile karşılaştırmada, lomber KMY korunma ve vertebral kırık riski azaltılmasında anlamlı olarak üstün bulunmuştur

- BF'lar, aktif vitamin D3 analogları ile karşılaştırmada, lomber KMY korunma ve vertebra kırık riski azaltılmasında anlamlı olarak üstün bulunmuştur

TEMD kılavuzu 2022 – GBOP

2022

- GK'ler en düşük doz ve en kısa süre kullanılmalı
- Farmakolojik tedavi orta veya yüksek kırık riski taşıyan hastalarda verilmeli
- Oral BF'lar tedavide en önemli ajanlar
- Osteoanabolik ajanlar kırık riski en yüksek olan hastalarda önerilebilir
- Tüm hastalar için yaşam tarzı önerileri; beslenme ve yük taşıyıcı egzersizler

NOGG 2021

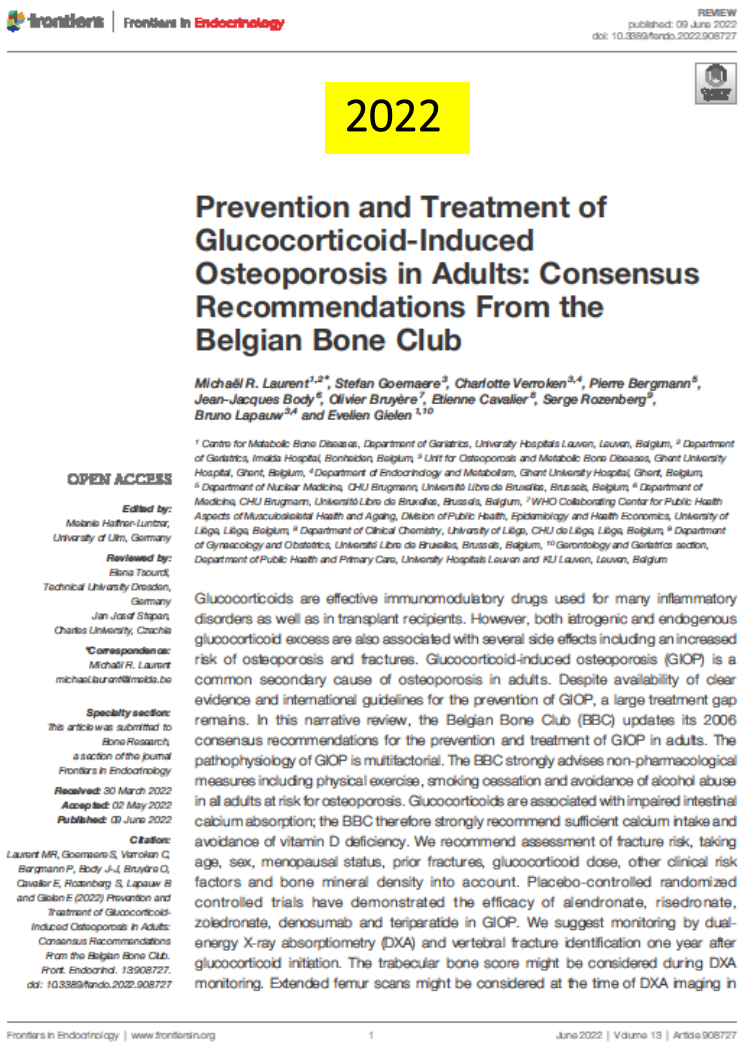
- **Çok yüksek kırık riski grubunda antirezorptif tedavi, GK tedavi başlangıcında başlanır**

  ≥70 yaş & frajilite kırığı & GK ≥7,5 mg/gün

BF önerilir (Alendronat veya risedronat, etkinlik ve maliyet nedeniyle)

- GK dozuna göre düzeltilmiş FRAX kırık riskinin hesaplanması

Doz	Prednizolon & eşdeğer doz (mg/gün)	Kalça kırık riski için uyarlama	Majör osteoporotik kırık riski için uyarlama
Düşük	<2,5	- %35	- % 20
Orta	2,5 – 7,5	yok	yok
Yüksek	≥7,5	+ %20	+ % 15



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REVIEW
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2022

Prevention and Treatment of Glucocorticoid-Induced Osteoporosis in Adults: Consensus Recommendations From the Belgian Bone Club

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Glucocorticoids are effective immunomodulatory drugs used for many inflammatory disorders as well as in transplant recipients. However, both iatrogenic and endogenous glucocorticoid excess are also associated with several side effects including an increased risk of osteoporosis and fractures. Glucocorticoid-induced osteoporosis (GIOP) is a common secondary cause of osteoporosis in adults. Despite availability of clear evidence and international guidelines for the prevention of GIOP, a large treatment gap remains. In this narrative review, the Belgian Bone Club (BBC) updates its 2006 consensus recommendations for the prevention and treatment of GIOP in adults. The pathophysiology of GIOP is multifactorial. The BBC strongly advises non-pharmacological measures including physical exercise, smoking cessation and avoidance of alcohol abuse in all adults at risk for osteoporosis. Glucocorticoids are associated with impaired intestinal calcium absorption; the BBC therefore strongly recommend sufficient calcium intake and avoidance of vitamin D deficiency. We recommend assessment of fracture risk, taking age, sex, menopausal status, prior fractures, glucocorticoid dose, other clinical risk factors and bone mineral density into account. Placebo-controlled randomized controlled trials have demonstrated the efficacy of alendronate, risedronate, zoledronate, denosumab and teriparatide in GIOP. We suggest monitoring by dual-energy X-ray absorptiometry (DXA) and vertebral fracture identification one year after glucocorticoid initiation. The trabecular bone score might be considered during DXA monitoring. Extended femur scans might be considered at the time of DXA imaging in

Belçika Kemik Kulübü (BBC) GBOP önerileri
Frontiers in Endocrinology 2022

- TBS, DXA'ya ek olarak önerilebilir
- Femur sken, ≥ 3 yıl GK kullanımında antirezorptif tedavi görenlerde önerilebilir
- Kemik döngüsü belirteçleri tedavi monitorizasyonunda önerilebilir
- Patofizyolojik farklar nedeniyle solid organ ve hematopoetik kök hücre transplantasyonuna bağlı OP, GBOP sınırlarını aşmakta, ancak BBC önerileri değerlendirme, koruma ve tedavi için benzer

Kılavuzlarda GBOP için ortak öneriler

- OP tedavisi, frajilite kırığı varsa kesinlikle önerilir
- GK≥7,5mg/g ve ≥3 ay kullanımda önerilir
- Çok yüksek kırık riski grubunda, GK tedavisi başlangıcında kemik korunmaya başlanır
- Premenopozal kadın ve <50 y erkeklerde, GK ≥3 ay planlanıyorsa, GBOP tedavisi frajilite kırığı varlığında verilir
- Diğer hastalarda tedavi kararı klinik olarak verilir

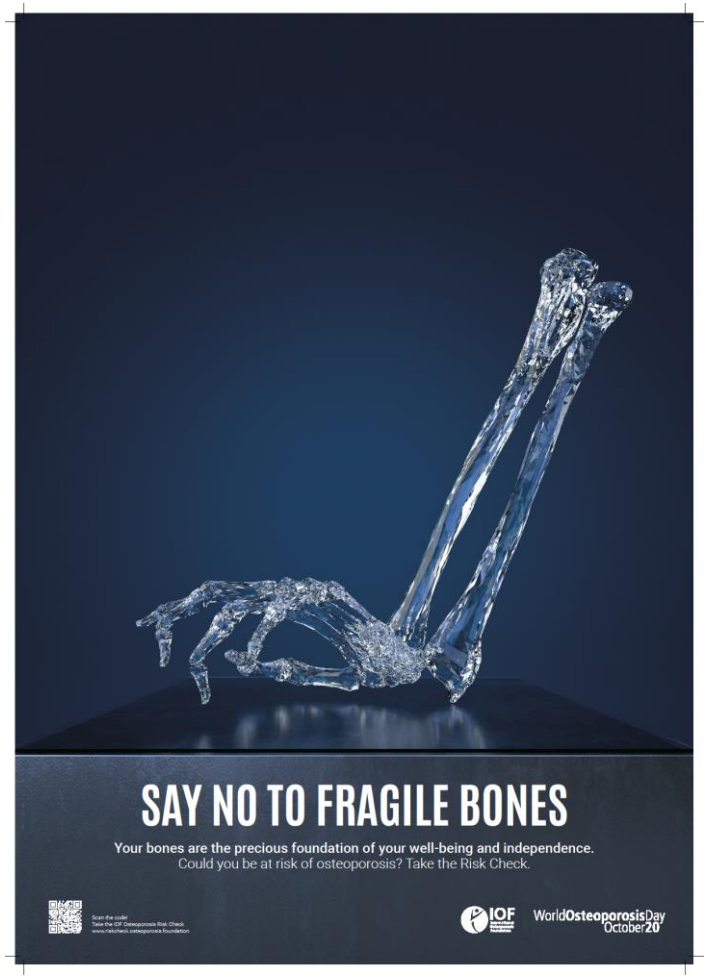
GBOP özet

- GBOP’da korunma ve tedavi mümkün, ancak erken başlanmalı
- GBOP risk kategorisi belirlenmeli
- Farmakolojik tedavi orta, yüksek ve çok yüksek kırık riski taşıyan hastalarda **kuvvetle önerilir**
- Farmakolojik olmayan tedaviler Vitamin D ve kalsiyum, bütün GK kullananlarda **kuvvetle önerilir**

Sonuç

- >3 ay süreyle GK tedavisi planlanan & devam eden erişkinlerde GBOP için değerlendirme kuvvetle önerilir
- Başlangıçta değerlendirme, klinik + KMY ve VFA veya spinal radyografi ile yapılır
- Oral/İV BF, denosumab veya PTH analogları seçilebilir
- Anabolik ajanlar başlangıç tedavisinde, şartlı olarak, yüksek veya çok yüksek kırık riskinde önerilebilir
- Özel popülasyonlar: Çocuk, transplant, gebelik olasılığı veya çok yüksek doz GK tedavisi gören hastalar dikkatle takip edilir
- GBOP tedavisinin sonlandırılması ve ardışık tedavilere dikkat edilir

Teşekkür ederiz

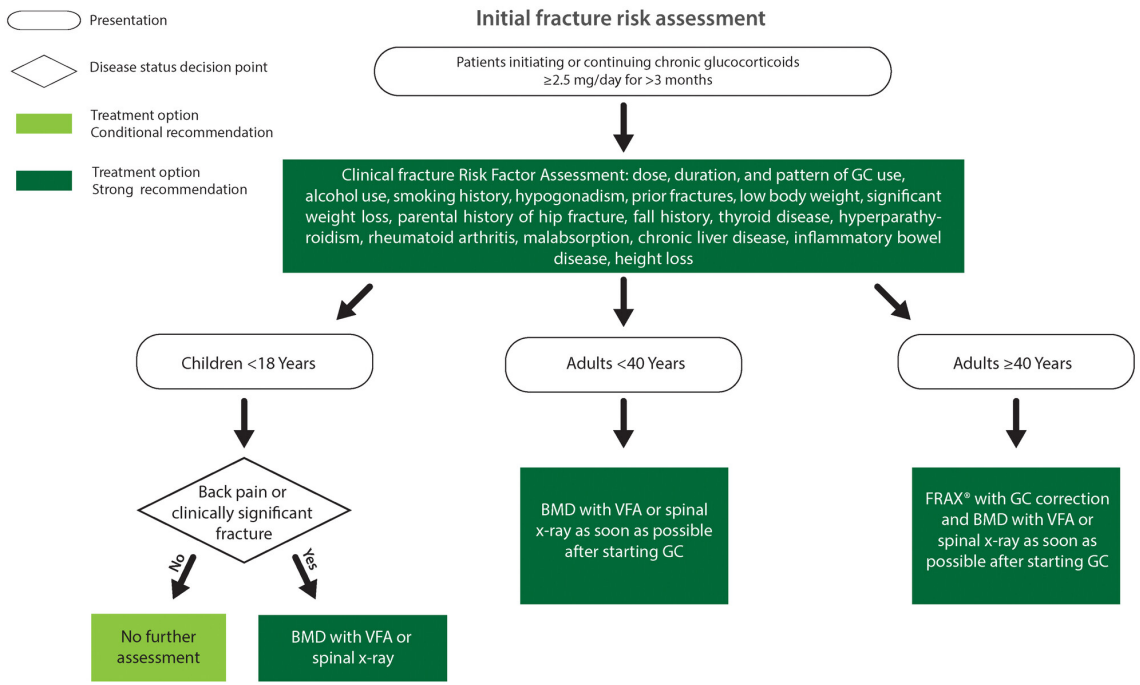


Olgu: 39 y kadın, premenopozal, RA tanısı 2 ay önce

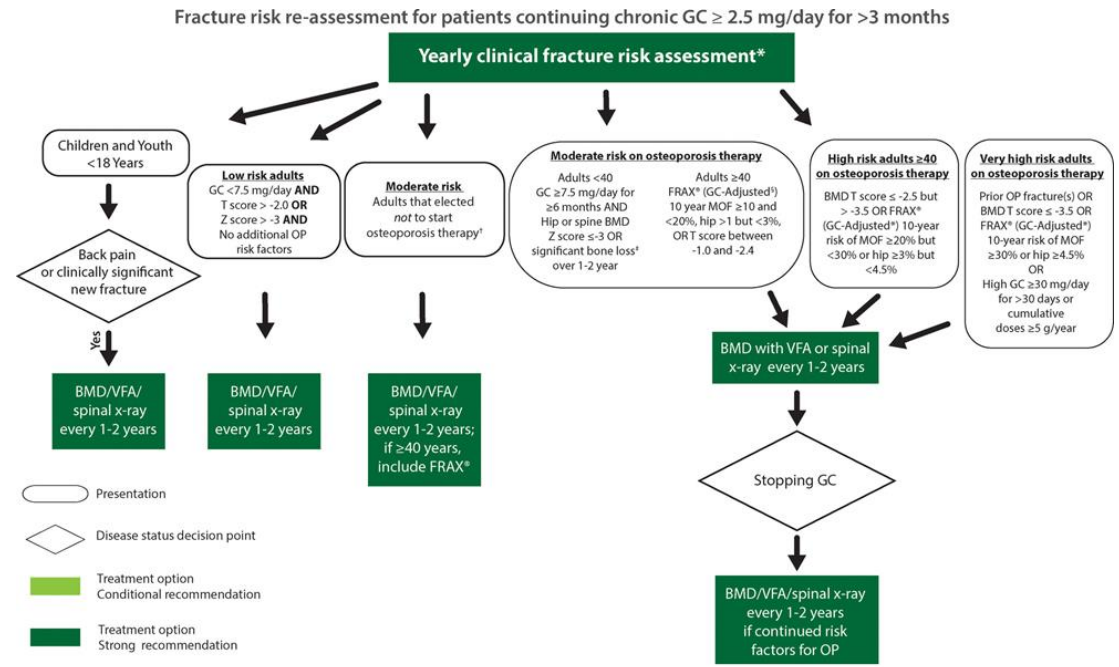
- Eklem tutulumu ellerde, omuzlarda ve dizlerde +.
  Eritrosit sedimentasyon hızı 38 mm, CRP 5 kat yüksek
  MTX oral 15 mg/haftalık ve prednizon 5 mg günlük başlanmış, 1 ay sonra kontrol planlanmış. Başka hastalık yok. Sigara kullanmıyor
- Kırık öyküsü yok. Ailede kırık yok. VKİ 25.
- Değerlendirme yapılmalı mı? Klinik, DXA, görüntüleme ?
- Osteoporoz tedavisi hemen başlamalı mıyız?
- GK kesildikten sonra takip devam etmeli mi?
- Gebelik durumunda OP tedavisi önerilir mi? Hangi ajan seçilebilir?

Olgu: 39 y kadın, premenopozal, RA tanısı 2 ay önce

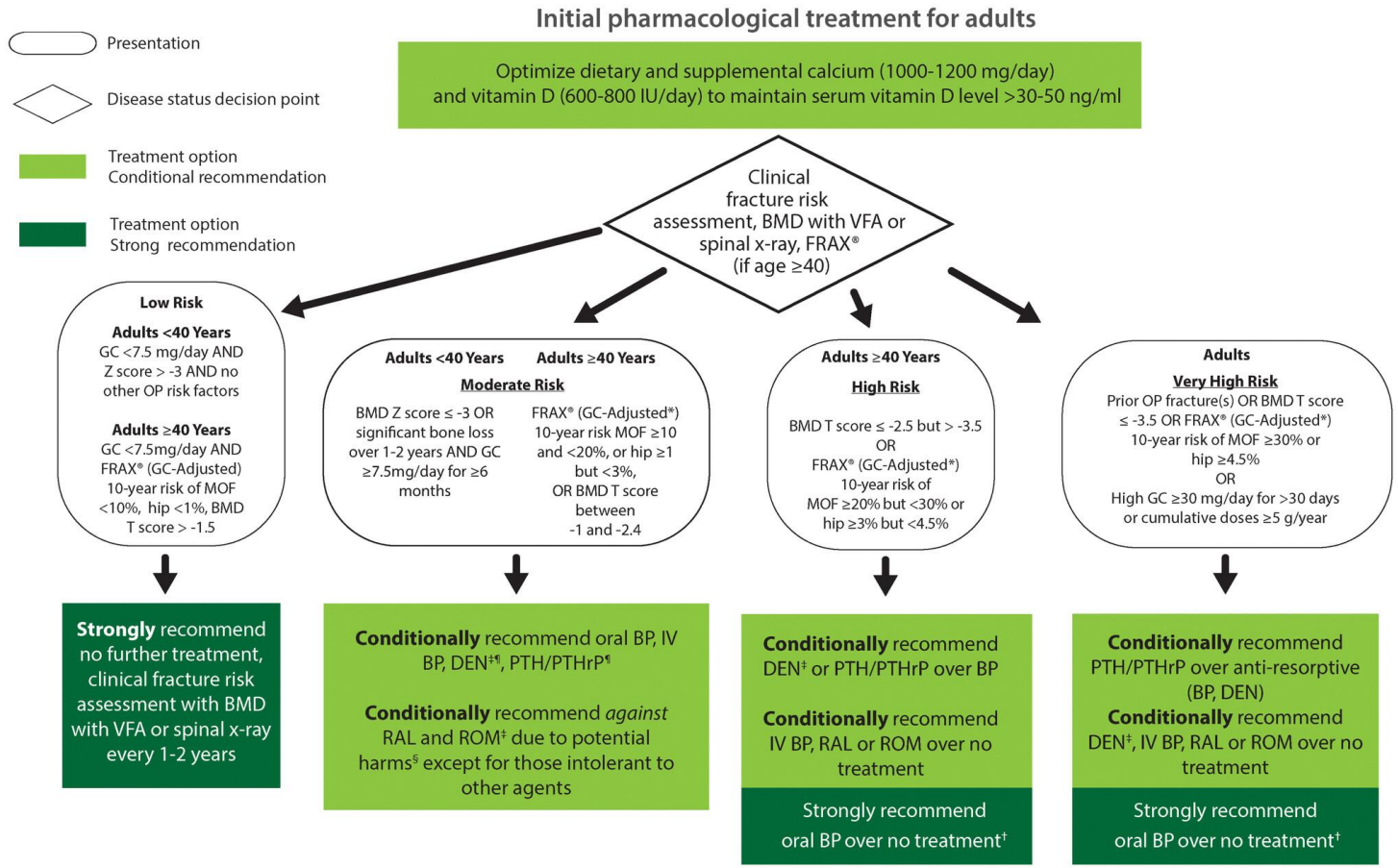
- Eklem tutulumu ellerde, omuzlarda ve dizlerde +.
  Eritrosit sedimentasyon hızı 38 mm, CRP 5 kat yüksek
  MTX oral 15 mg/haftalık ve prednizon 5 mg günlük başlanmış
- Kırık öyküsü yok. Ek riski yok
- Değerlendirme: Klinik, DXA Z-skoru > 2,5, görüntüleme ?
- Osteoporoz tedavisi hemen başlamalı mıyız? Düşük risk grubu
- GK kesildikten sonra takip devam etmeli mi? Evet
- Gebelik durumunda OP tedavisi önerilir mi? Hangi ajan seçilebilir?



OP = osteoporosis; FRAX® = Fracture risk assessment tool, validated for adults ≥40 Years, https//www.shef.ac.uk/FRAX/Tool.jsp; FRAX® with GC correction = If GC dose is >7.5 mg/day, increase the MOF risk by multiplying 1.15 times and hip fracture risk by multiplying 1.2 times (e.g., if hip fracture risk is 2.0% multiply by 1.2 for adjusted risk =2.4%); BMD = bone mineral density testing

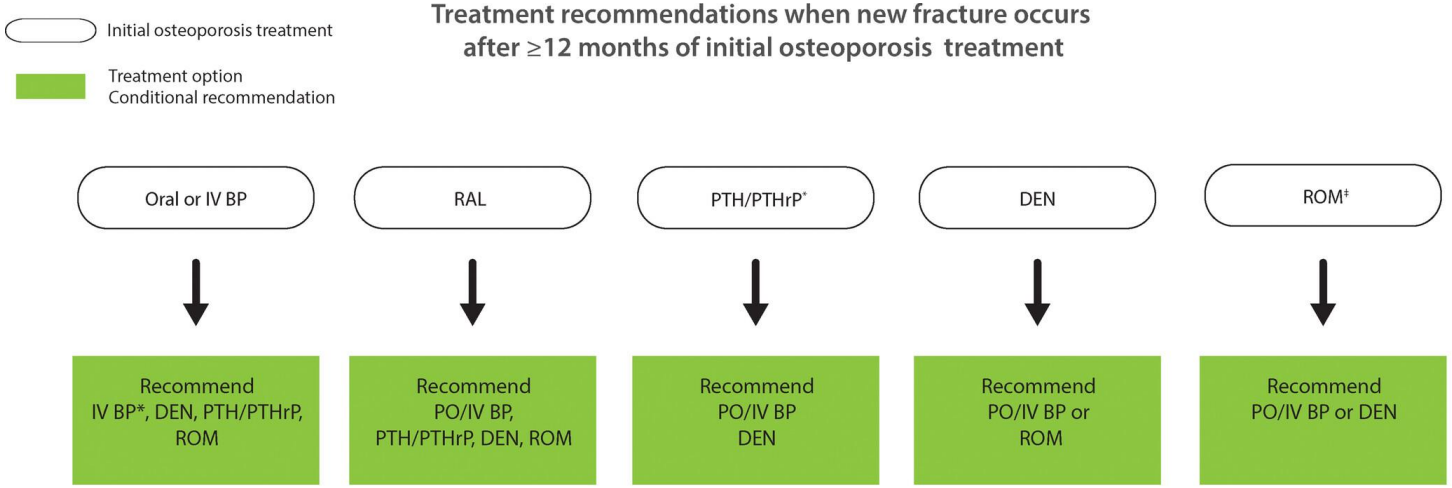


OP = osteoporosis; GC = glucocorticoids; FRAX® = Fracture risk assessment tool can only be used in adults ≥40 years; BMD = bone mineral density testing; *Clinical fracture risk assessment: dose duration and pattern of GC use, alcohol use, smoking history, hypogonadism, prior fractures, low body weight, significant weight loss, parental history of hip fracture, fall history, thyroid disease, hyperparathyroidism, rheumatoid arthritis, malabsorption, chronic liver disease, inflammatory bowel disease, height; †Moderate risk adults should be offered therapy but may choose not to be treated; ‡ > least significant decline according to DXA machine (typically 3-5%); §FRAX® GC correction for GC ≥7.5 mg/day example: if hip fracture risk is 2.0% multiply by 1.2 for adjusted risk = 2.4%



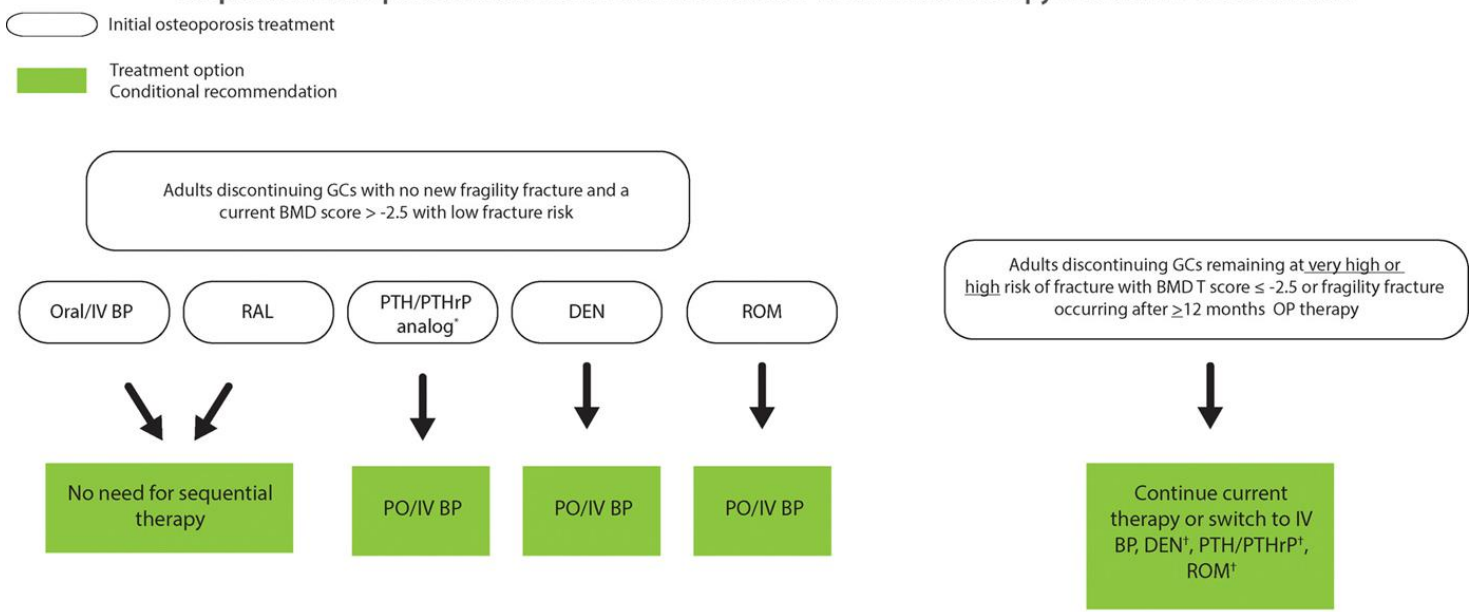
FRAX® = https//www.shef.ac.uk/FRAX/Tool.jsp; MOF= major osteoporotic fracture; *FRAX® GC correction for GC ≥7.5 mg/day example: if hip fracture risk is 2.0% multiply by 1.2 for adjusted risk = 2.4%, BP = bisphosphonate, IV = intravenous, PO = oral, PTH/PTHrP = parathyroid hormone/ parathyroid hormone related protein, DEN = denosumab, RAL = raloxifene, ROM = romosozumab, †Based on fracture data in GIOP, ‡Women who may become pregnant need birth control and avoid pregnancy until >5 months after last dose; §RAL(PE, DVT, fatal stroke); ROM (myocardial infarction, stroke and death; conditionally recommend RAL/ROM use in the highest risk patients unable to tolerate other agents; ¶Use with caution in persons with open growth plates

Treatment recommendations when new fracture occurs after ≥12 months of initial osteoporosis treatment



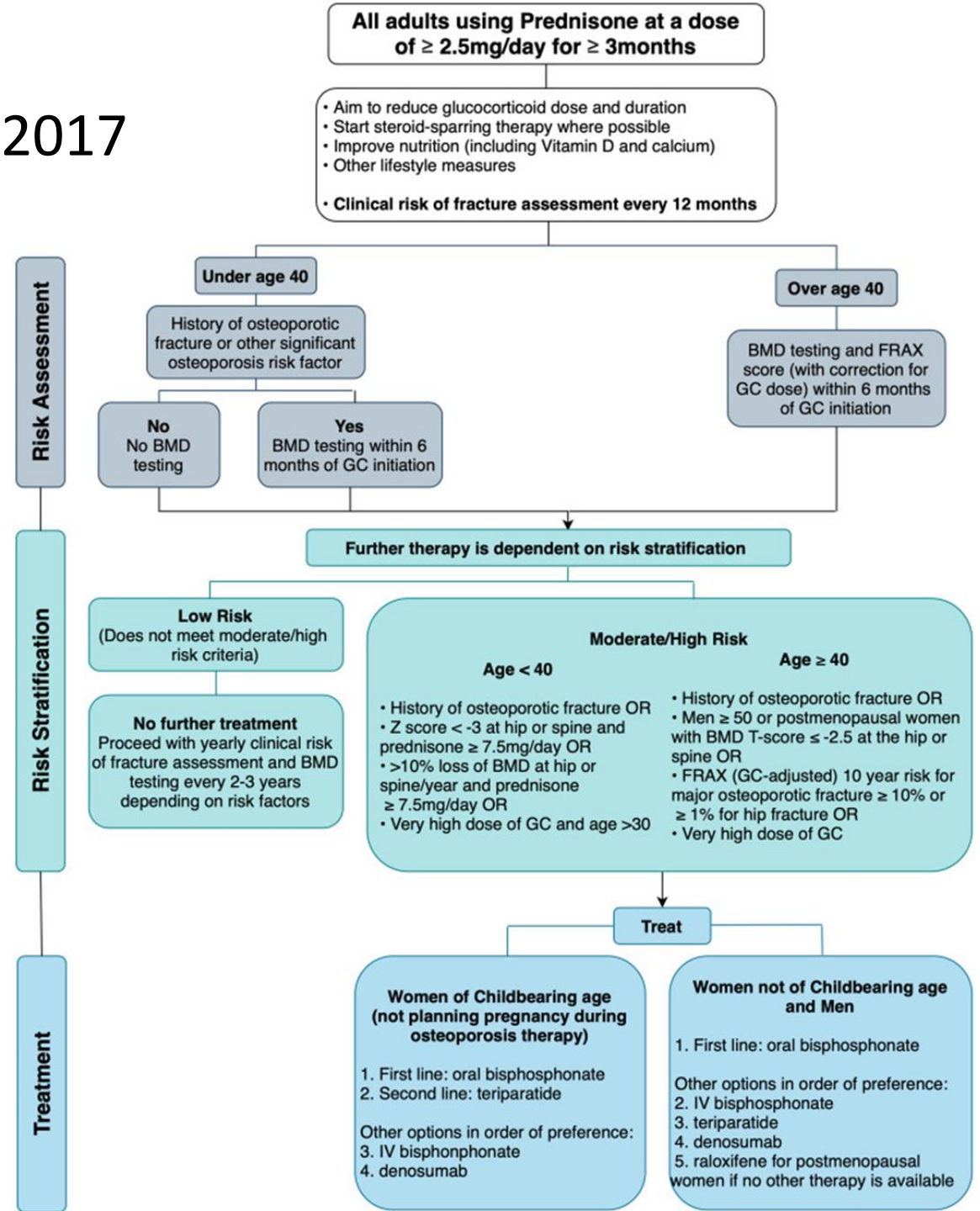
BP = bisphosphonate, IV = intravenous, PO = oral, DEN = denosumab, ROM = romosozumab, PTH = parathyroid hormone, PTHrP = PTH related peptide, RAL = raloxifene, OP = osteoporosis. BMD = bone mineral density, *If oral BP absorption or adherence a concern, †Bone loss may be gradual and anti-fracture efficacy may last 18 months but should be followed by anti-resorptive.
‡ROM is used for 12 months only

Sequential osteoporosis treatment recommendation when initial therapy and GC are discontinued



BP = bisphosphonate, IV = intravenous, PO = oral, DEN = denosumab, ROM = romosozumab, PTH = parathyroid hormone, PTHrP = PTH related peptide, RAL = raloxifene, OP = osteoporosis; *Bone loss may be gradual and anti-fracture efficacy maintained 18 months but antiresorptive is recommended; †Will require sequential therapy with BP

ACR kılavuzu 2017



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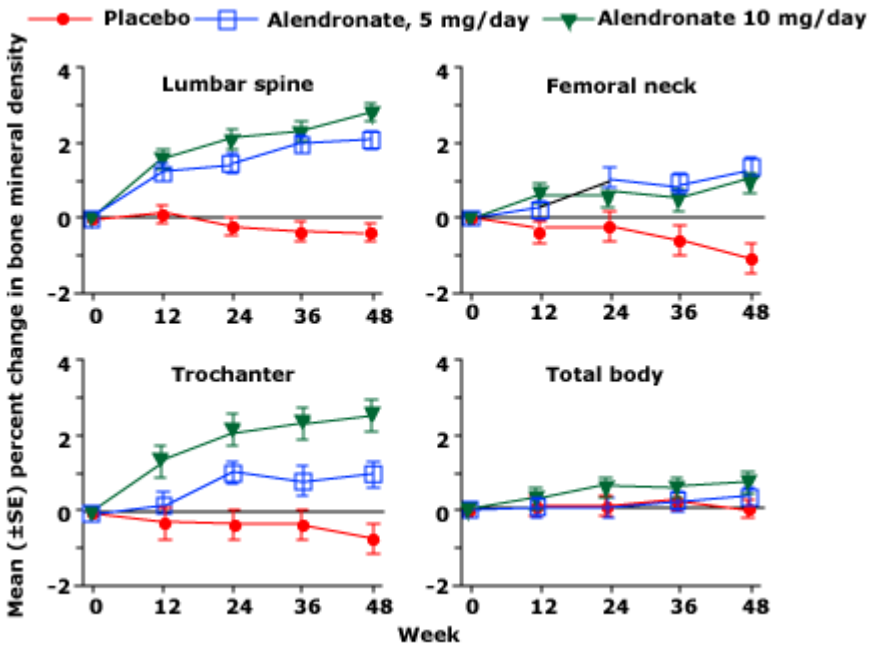

Alendronat (10 mg/gün) veya plasebonun KMY üzerine etkisi:
477 hasta; 7,5 mg prednison kullanımı
Lomber KMY 48 hafta alendronat kullananlarda %2,1 ve 2,9 oranında artış gösterirken, plasebo grubunda %0,4 azalmıştır
Femur boyun, trokanter ve tüm vücut KMY alendronat grubunda anlamlı olarak artmakta