Baş Boyun Kanserlerinde Görüntülemede Güncel Yaklaşımlar

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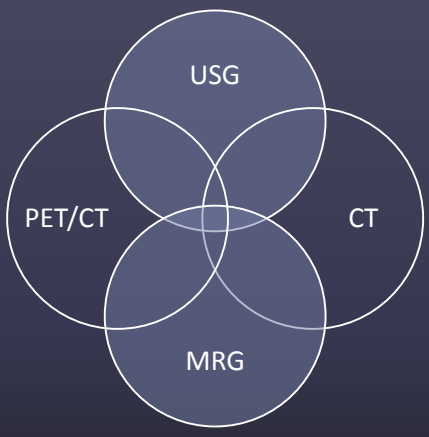
Medstar Antalya Hastanesi

Görüntüleme Yöntemleri



- Kontrast çözünürlük
  - MR
- Uzaysal çözünürlük
  - BT
- Metabolik çözünürlük
  - PET
- Temporal çözünürlük
  - USG

Görüntülemeden ne bekleniyor?

Lezyon var mı?	• Tanı
Malign mi ?	• Ayırıcı tanı
Malignite nerede?	• Evreleme
Tedavi etkin mi?	• Tedavi yanıtı
Malign doku kaldı mı?	• Rezidü-nüks

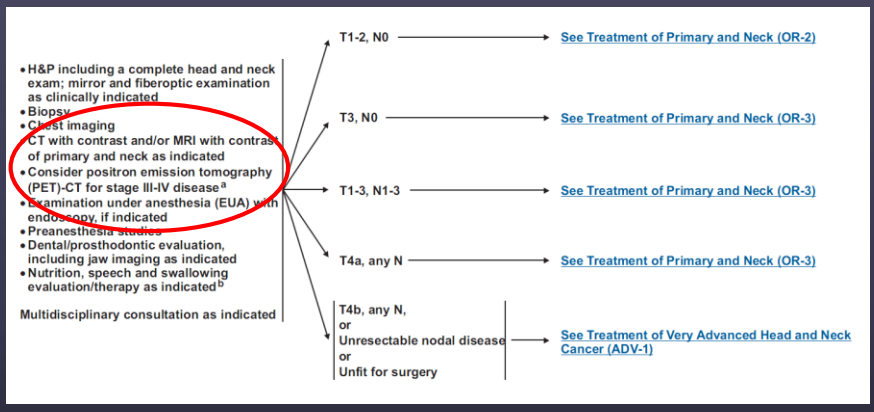
Görüntülemeler ne sağlıyor?

- Primer odak saptama
- Tümörün karakterizasyonu
- Lenf nodlarının değerlendirilmesi
- Uzak metastaz
- Prognostik bilgi
- Tedavi planı
- Tedavi yanıtı
- Nüks veya rezidüel hastalık
- İkinci primer

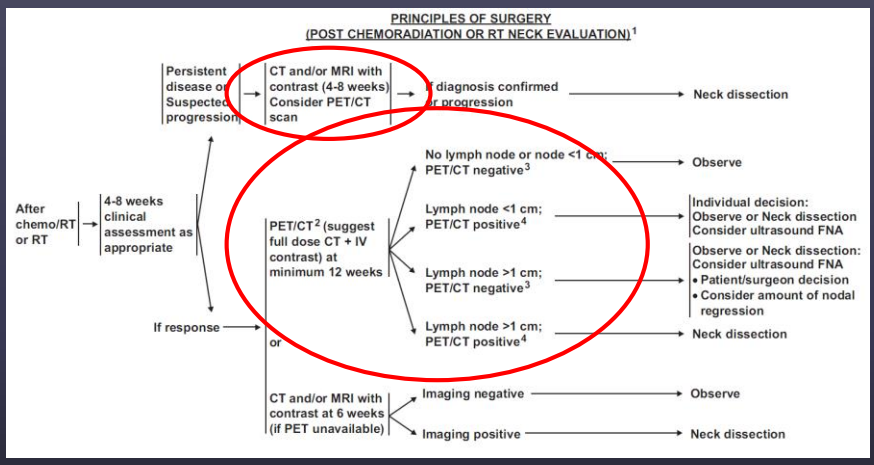
Görüntülemede neyi arıyoruz?

Yer kaplayıcı lezyon	• Lokalizasyon, Boyut, Submukozal yayılım
Yağ planları	• Uzanımlar, Silinme, Yer değiştirme, Perinöral yayılım
Kemik ve kartilaj	• Destruksiyon, Ekspansiyon, Skleroz
Dansite değişiklikleri	• Kalsifikasyon, Ossifikasyon, İç yapı
Kontrast madde ile boyanma	• Dansite değişikliği, Perfüzyon
Vasküler yapıları çevreleme	• 180-270 derece
Patolojik lenf nodları	• Boyut, karakterizasyon, metabolik aktivite
Metabolik aktivite	• Nekroz, prognoz, malign-benign
Uzak metastaz	• Akciğer, kemik
İkinci primer	• Baş boyun, akciğer, özefagus

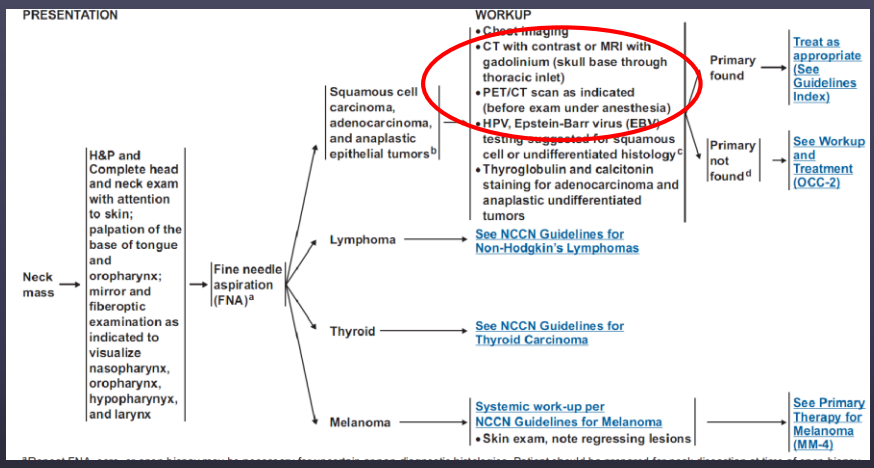
Hangi görüntüleme? Ne zaman? NCCN 2012



NCCN, Kemoterapi ve Radyoterapi sonrası



NCCN 2012 okkult primer



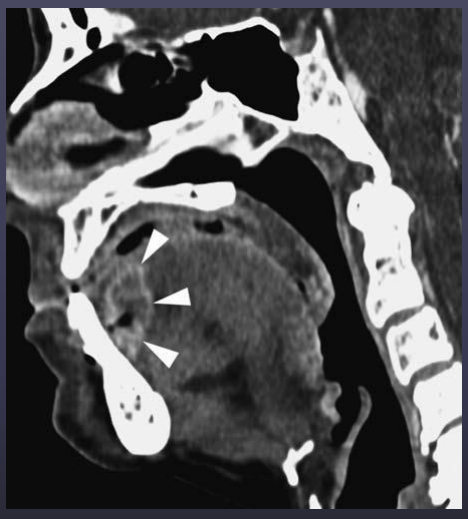
PET/CT ne zaman?

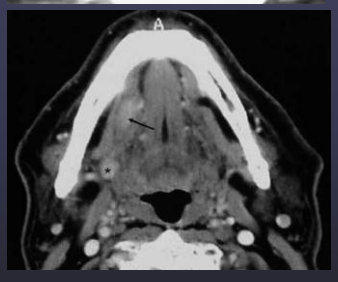
- T 1: Önerilmiyor
- T 2: Tartışmalı
- T 3 ve T4
- Nodal metastaz
  - 4 ten fazla
  - Bilateral
  - 6 cm üzerinde
  - Seviye IV tutulumu
- Nüks tümör kuşkusu
- İkinci primer kanser kuşkusu

Bilgisayarlı Tomografi

- Kalsifikasyon
- Kartilaj, kemik invazyonu
- Vasküler lezyonlar
- MDCT: multiplanar
- Tercih
  - İNFRA-HYOİD

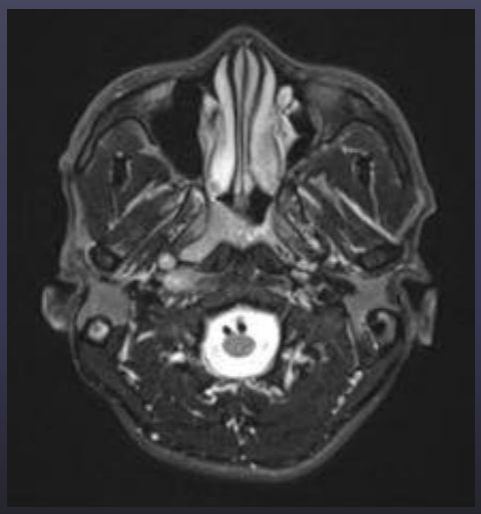
CT



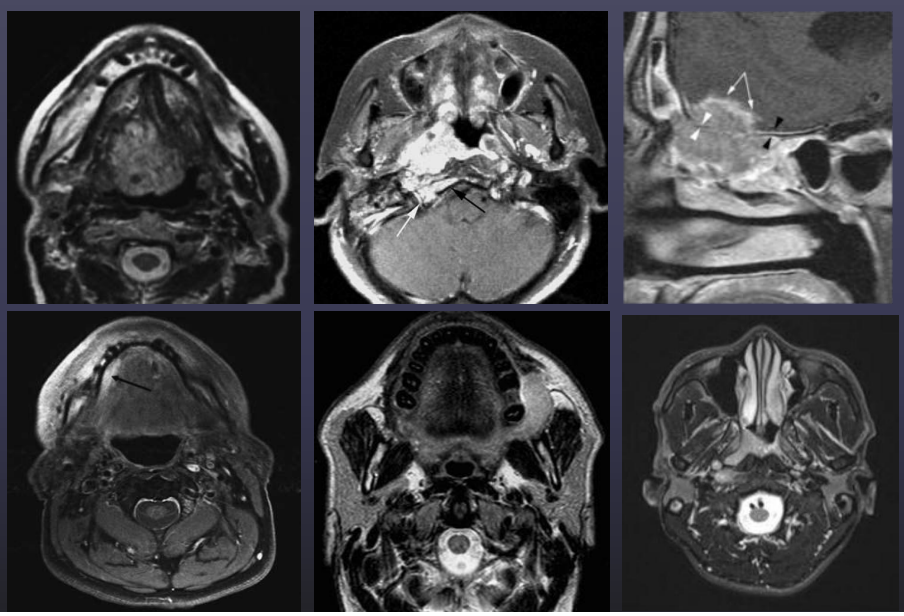


Manyetik Rezonans Görüntüleme

- Tümör-kas-sekresyon ayırımı
- Perinöral yayılım
- İntrakranial uzanım
- Kemik iliği
- Submukozal yayılım
- Radyasyon yok
- Dental artefakt az
- Tercih
  - SUPRA-HYOİD



MRG

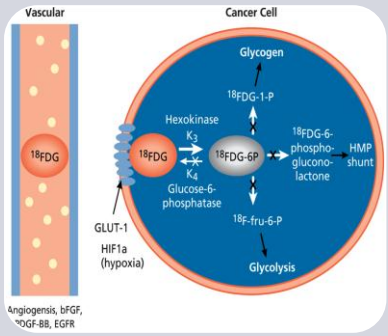


BT ve MRG'nin Dezavantajları

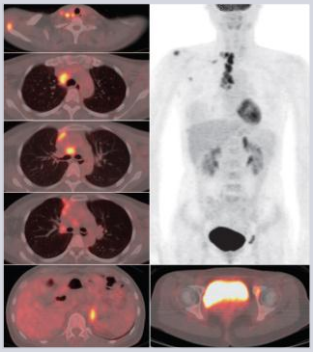
Morfolojik özellik	• Küçük lezyonlar
Boyut	• Büyük lenf nodları
Tedavi etkisi	• Bozulmuş anatomi
Uzak metastaz	• Tüm vücut inceleme

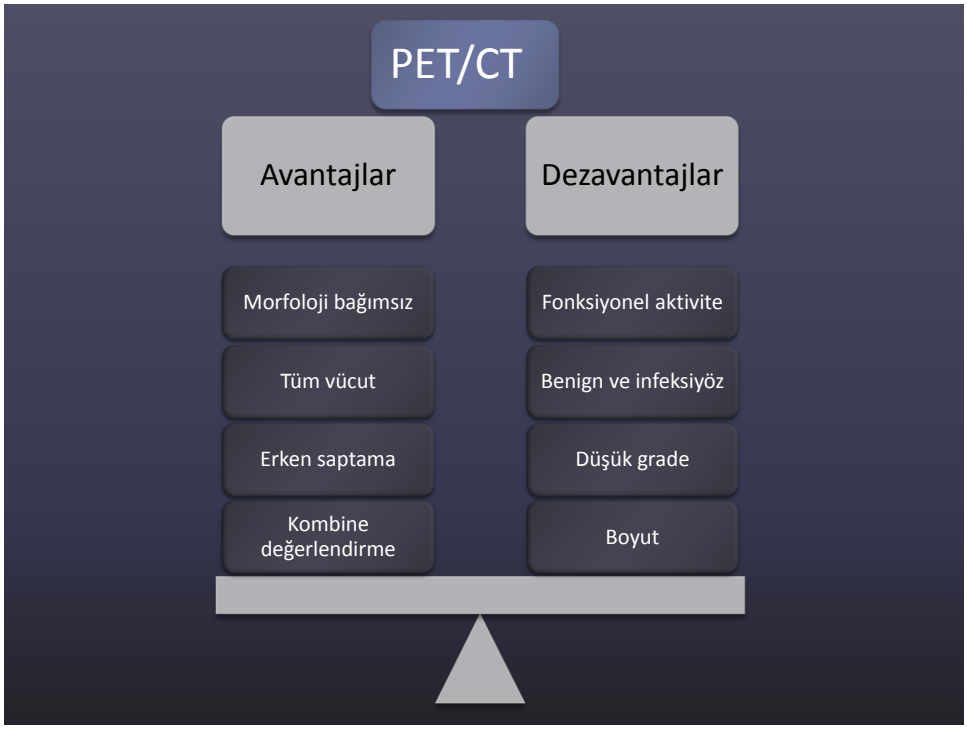
Pozitron Emisyon Tomografi/CT

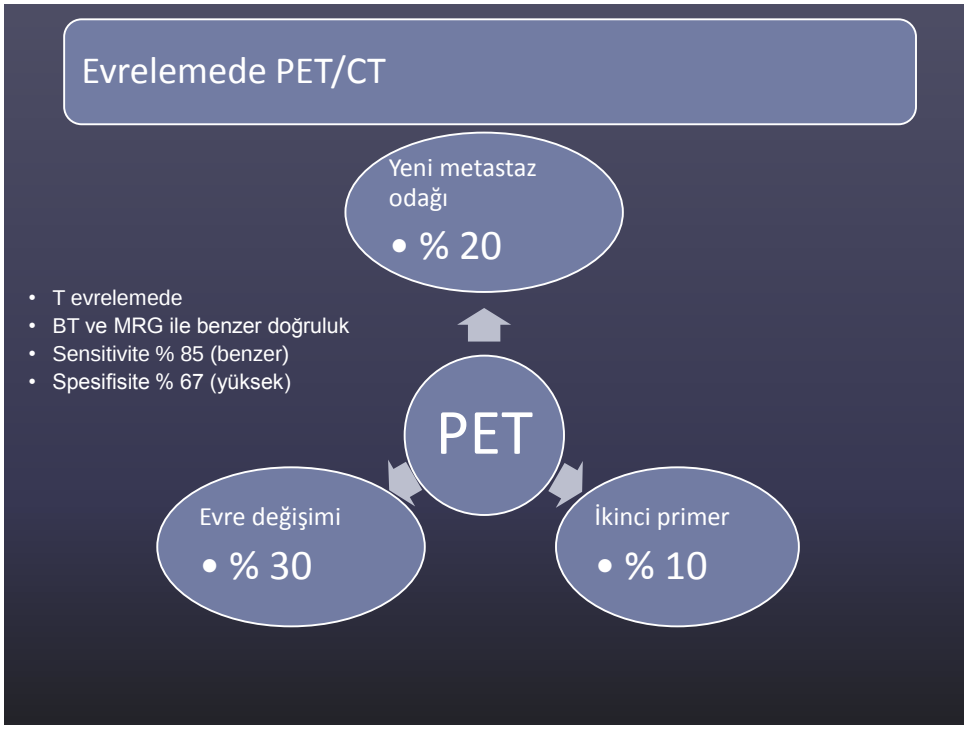
Metabolik

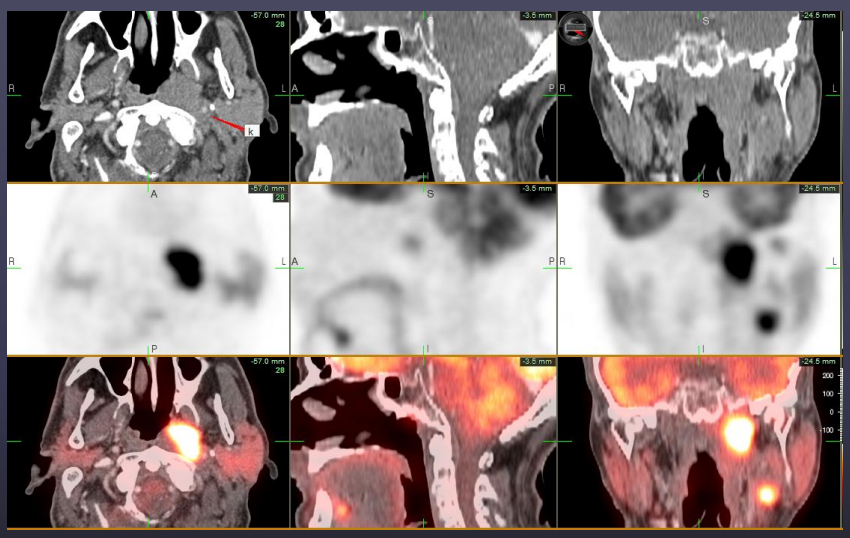


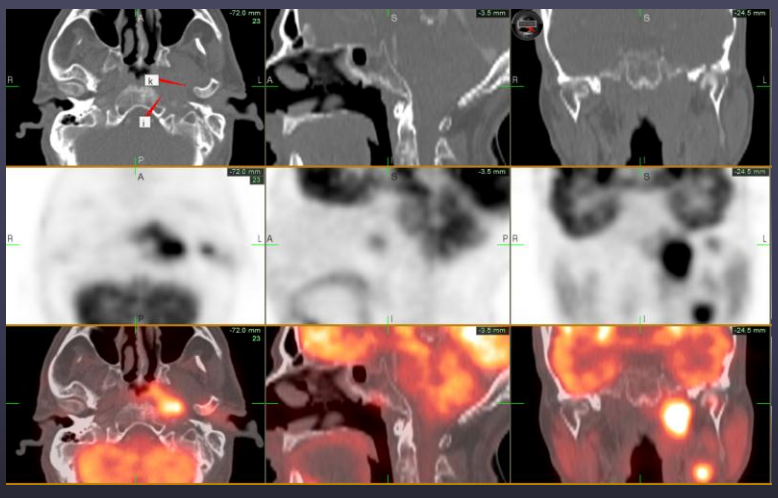
Hibrid

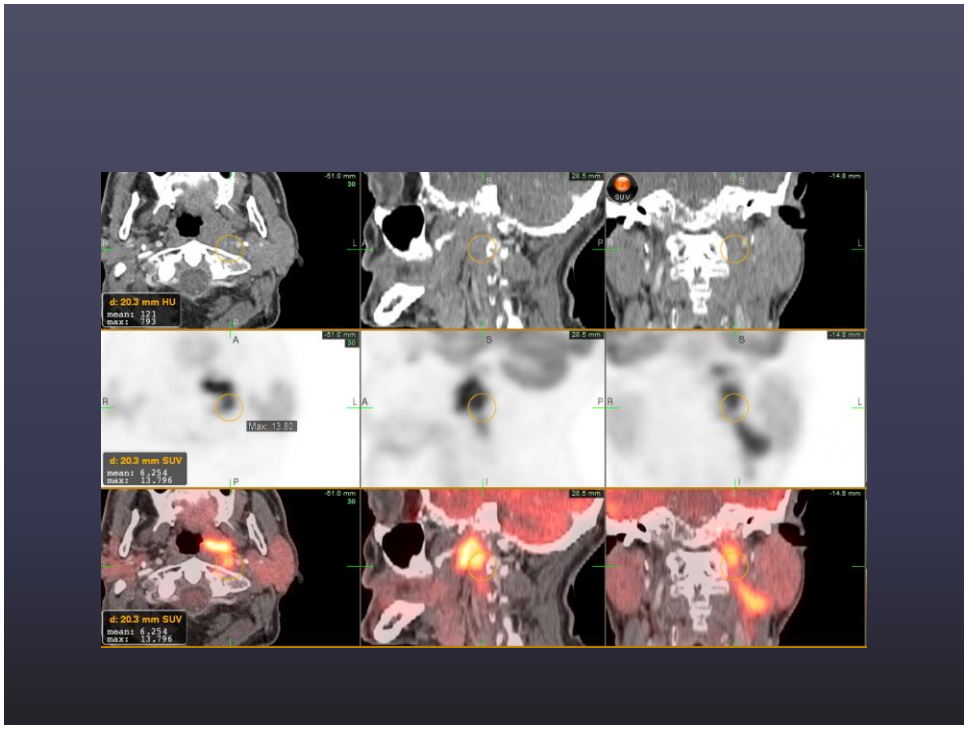


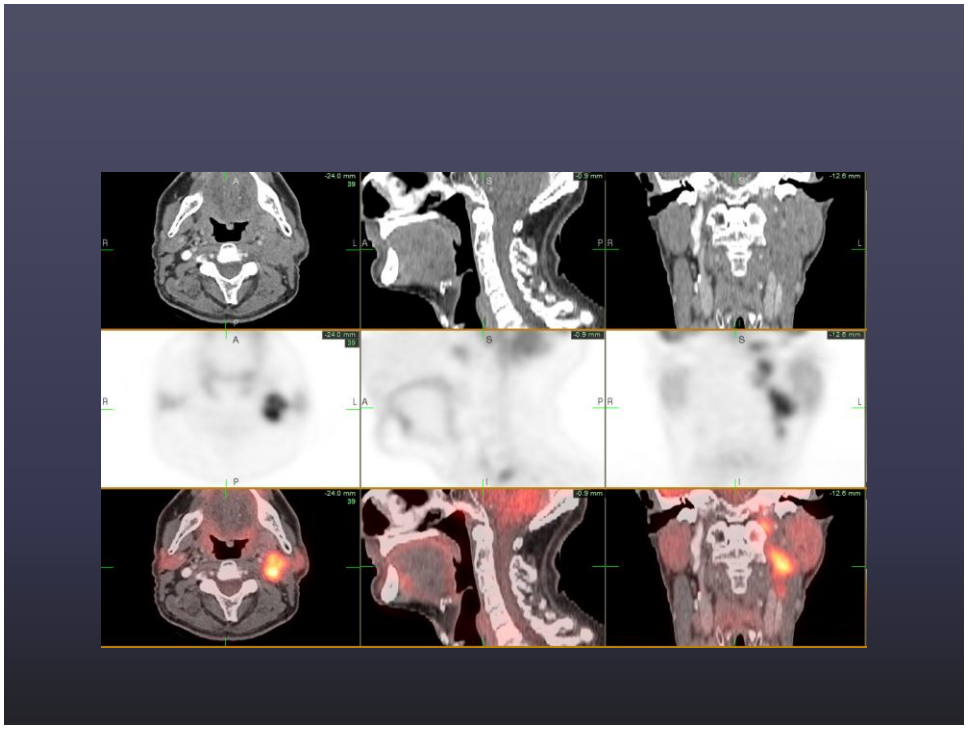

PET/CT
Avantajlar
Dezavantajlar
Morfoloji bağımsız
Tüm vücut
Erken saptama
Kombine değerlendirme
Fonksiyonel aktivite
Benign ve infeksiyöz
Düşük grade
Boyut

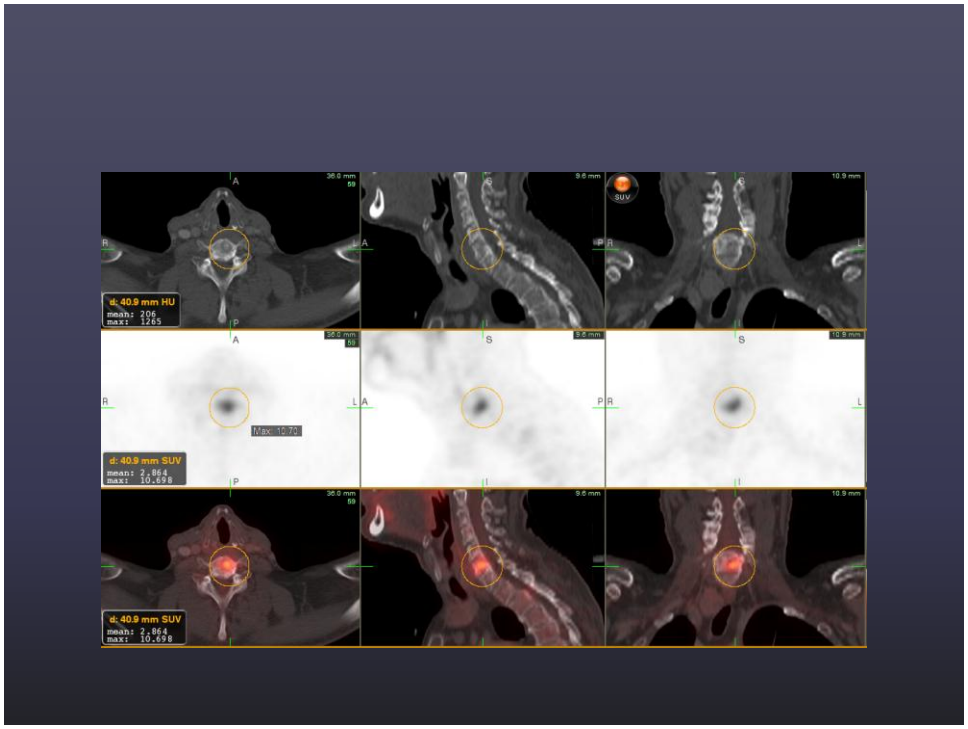

Evrelemede PET/CT
Yeni metastaz odağı
• % 20
• T evrelemede
• BT ve MRG ile benzer doğruluk
• Sensitivite % 85 (benzer)
• Spesifisite % 67 (yüksek)
PET
Evre değişimi
• % 30
İkinci primer
• % 10

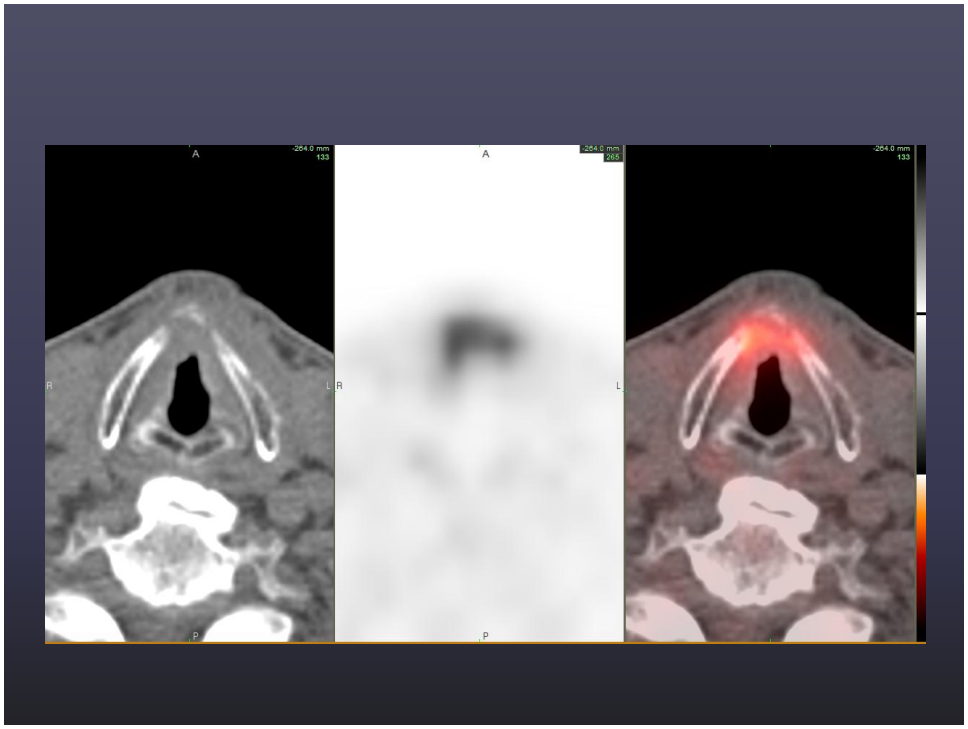


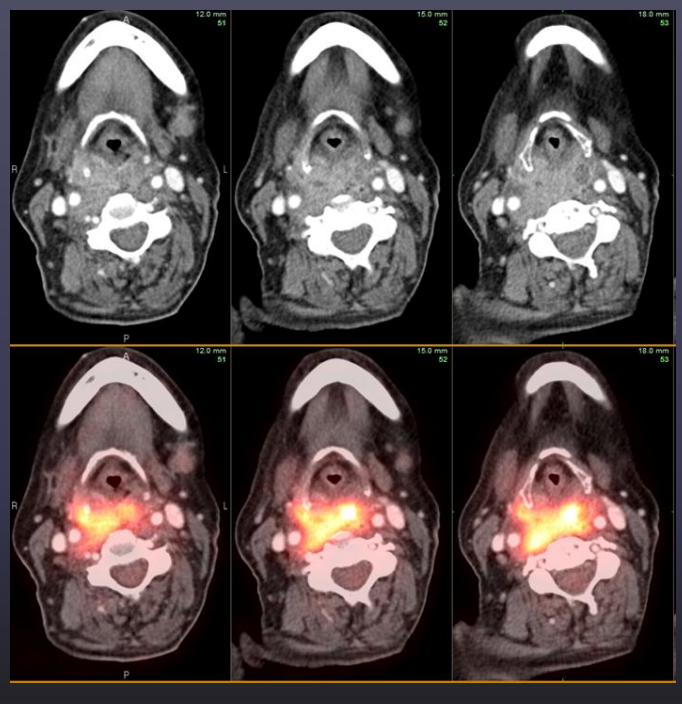



d: 20.3 mm HU
mean: 121
max: 193
Max: 13.80
d: 20.3 mm SUV
mean: 6.254
max: 13.796
d: 20.3 mm SUV
mean: 6.254
max: 13.796




d: 40.9 mm HU
mean: 206
max: 1265
d: 40.9 mm SUV
mean: 2.864
max: 10.698
d: 40.9 mm SUV
mean: 2.864
max: 10.698

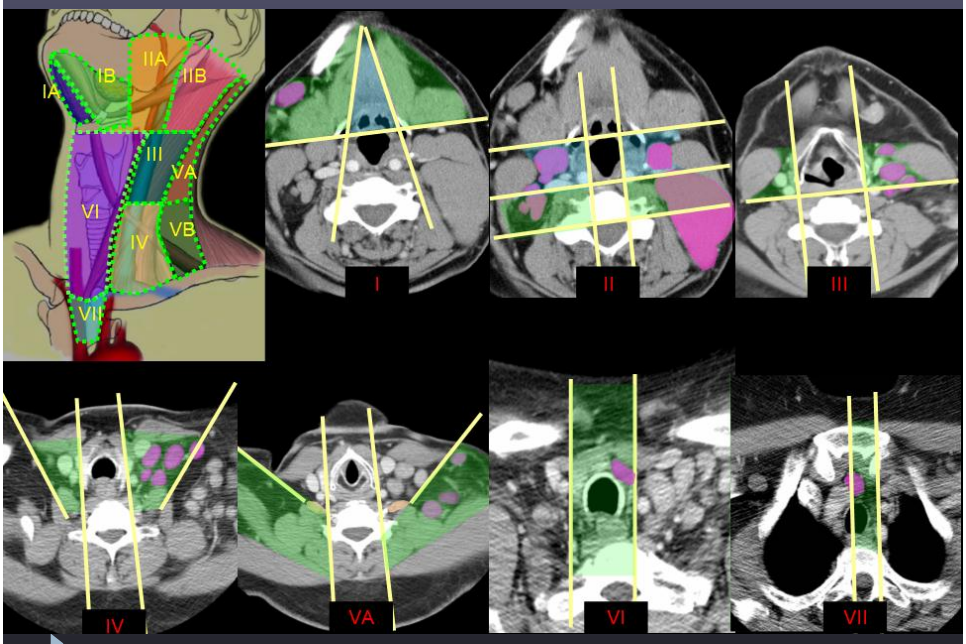




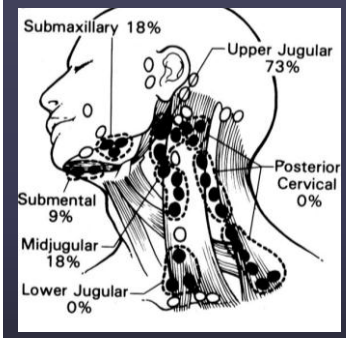
Nodal Evreleme

Baş boyunda nodal evreleme

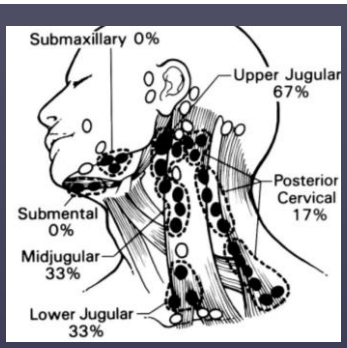
Baş Boyun		Nasopharyngeal cancer	
N1	• Tek ipsilateral ≤ 3 cm	N1	• Aynı taraf ≤ 6 cm
N2a	• Tek ipsilateral 3-6 cm	N2	• Bilateral ≤ 6 cm
N2b	• Multiple ipsilateral < 6 cm	N3	• N3a > 6 cm • N3b supraklavikular
N2c	• Bilateral or kontralateral < 6 cm		
N3	• Herhangi LAP> 6cm		



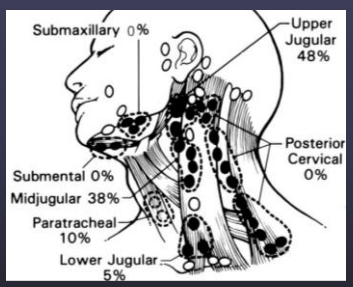
Oral kavite, dil



Dil kökü



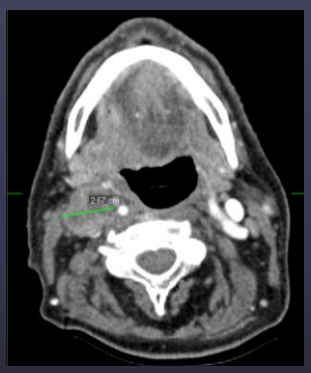
Larinks



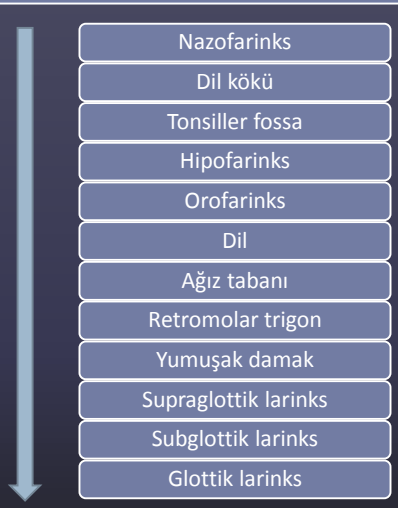
Clinical Anatomy 25:54–71 (2012)

Standart nodal değerlendirme

- Boyut (uzun transaksial çap)
  - Seviye I ve II: 15 mm
  - Diğerleri: 10 mm
- Kontur
- Nekroz
- Şekil
- Yağlı hilus
- Heterojenite
- Kümelenme



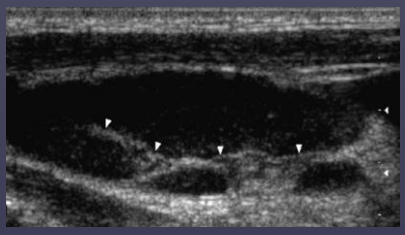
Nodal metastaz sıklığı

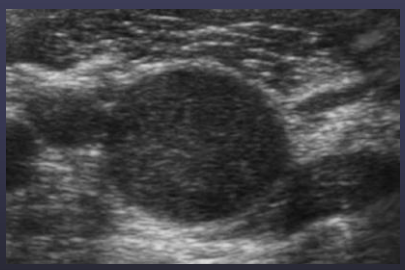


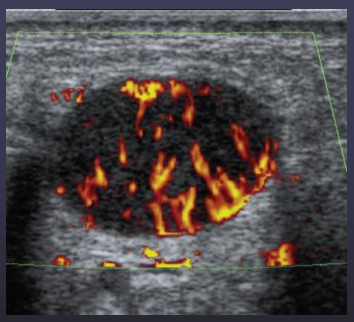
Lenf Nodları

- Klinik değerlendirme
  - % 15-20 YN
  - % 30-50 YP
- < 10 mm % 20 metastaz
- > 10 mm % 40 benign
- Elektif boyun disseksiyonu
  - % 75 i negatif
- Standart boyun disseksiyonu
  - I,V, IV ve retrofarengeal içermez
- Rezektabilite
  - Vasküler invazyon
  - Ekstranodal yayılım

USG







- MR meta-analiz
- Sensitivite % 76
- Spesifisite % 86
- Acad Radiol. 2012 Mar;19(3):331-40.

Imaging modality	Mean sensitivity 95% CI	Mean specificity 95% CI
CT	0.81 (0.68–0.90)	0.76 (0.62–0.87)
US	0.87 (0.76–0.93)	0.86 (0.74–0.93)
MRI	0.81 (0.65–0.91)	0.63 (0.43–0.80)
USgFNAC	0.80 (0.57–0.92)	0.98 (0.93–0.997)
USPIO-MRI	0.74 (0.44–0.91)	0.88 (0.66–0.96)

European Journal of Radiology 64 (2007) 266–272

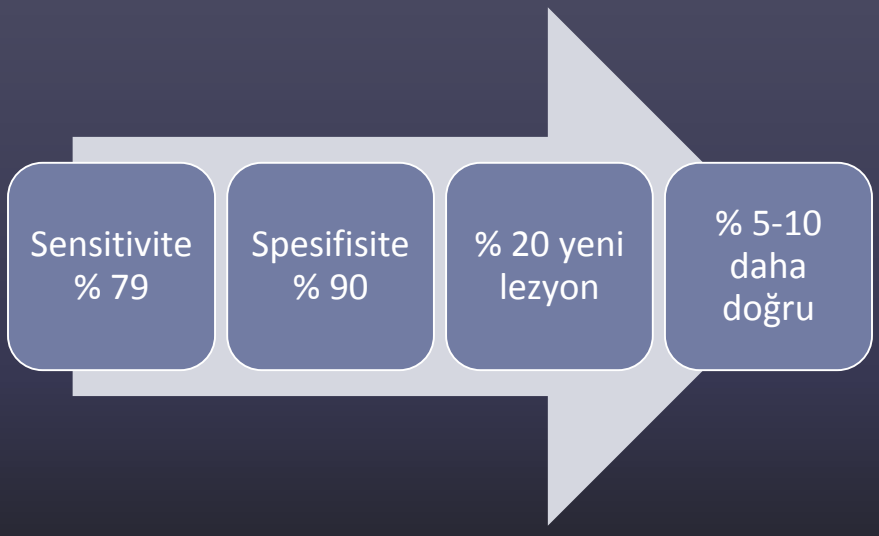
PET/CT nodal değerlendirme?

Normal anatomik veya fizyolojik alanlar dışında kan havuzu veya komşu yumuşak dokulara göre artmış fokal tutulum

SUVmax

SUV > 2.5 doğruluğu % 77

PET/CT ile nodal evreleme

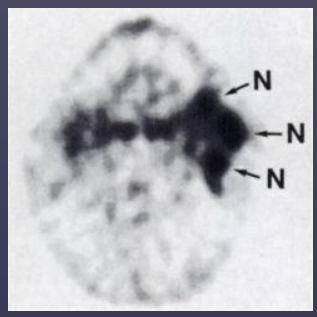


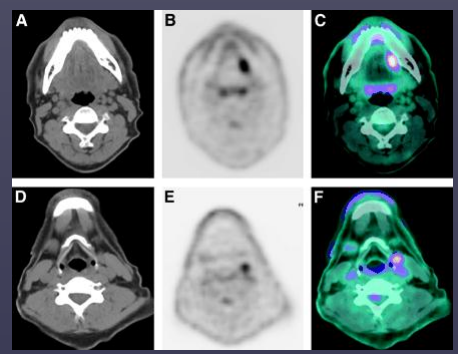
Lenf nodlarında görüntüleme

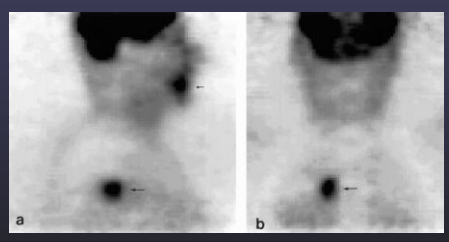
Diagnostic methods compared	No. of studies (references)	Independent estimates (95% CI)		Likelihood ratio (95% CI)	
		Sensitivity	Specificity	LR+	LR−
CT	16 (20,21,23,24,26,28,31, 32,36,40,43–47,49,50)	0.74 (0.61 to 0.83)	0.76 (0.68 to 0.83)	3.12 (2.32 to 4.21)	0.35 (0.23 to 0.51)
^{18}F-FDG PET		0.82 (0.72 to 0.89)	0.86 (0.78 to 0.91)	5.64 (3.61 to 8.83)	0.22 (0.14 to 0.34)
MRI	9 (20,21,24,31,40,43, 44,47,48,51)	0.78 (0.54 to 0.92)	0.80 (0.67 to 0.88)	3.86 (2.01 to 7.38)	0.27 (0.10 to 0.70)
^{18}F-FDG PET		0.78 (0.64 to 0.87)	0.85 (0.79 to 0.90)	5.07 (3.47 to 7.41)	0.27 (0.16 to 0.44)
CT + MRI	4 (19,27,34,47)	0.66 (0.44 to 0.82)	0.76 (0.53 to 0.90)	2.73 (1.43 to 5.19)	0.45 (0.28 to 0.72)
^{18}F-FDG PET		0.73 (0.58 to 0.84)	0.89 (0.84 to 0.93)	6.85 (4.50 to 10.42)	0.30 (0.18 to 0.49)
USFNA	4 (20,21,25,39)	0.42 (0.01 to 0.97)	0.96 (0.76 to 0.99)	10.87 (0.51 to 230.6)	0.61 (0.12 to 3.19)
^{18}F-FDG PET		0.45 (0.27 to 0.64)	0.88 (0.76 to 0.95)	3.79 (1.49 to 9.60)	0.63 (0.42 to 0.92)

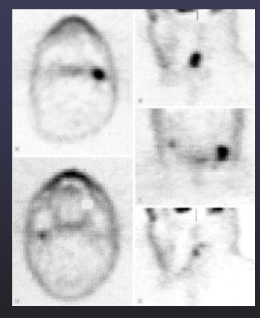
J Natl Cancer Inst 2008;100: 712 – 720

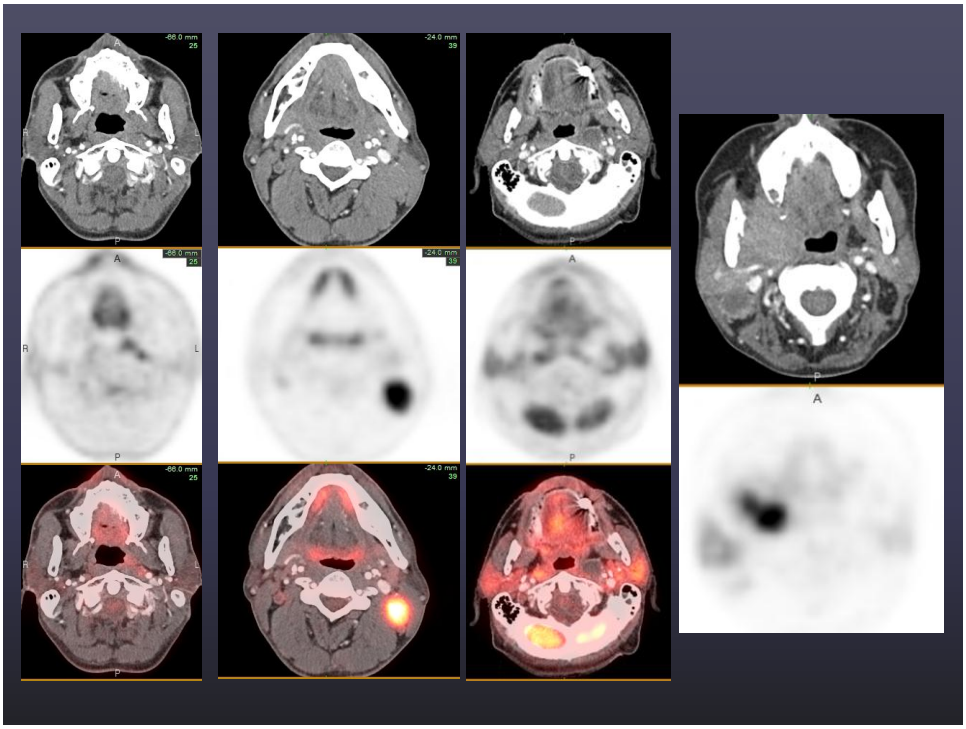
Meta-analiz











Klinik N0 hastalıkta PET/CT

- Malignite olasılığı % 25

2008, meta-analiz,32 çalışma 1236 hasta (1994-2007)

	PET	BT	MRG
Sensitivite	% 50	%14-80	%29-85
Spesifisite	% 90	%80-100	%80-100

Kyzas PA et al. 18 F-Fluorodeoxyglucose Positron Emission Tomography to Evaluate Cervical Node Metastases in Patients With Head and Neck Squamous Cell Carcinoma: A Meta-analysis. J Natl Cancer Inst 2008;100: 712 – 720.

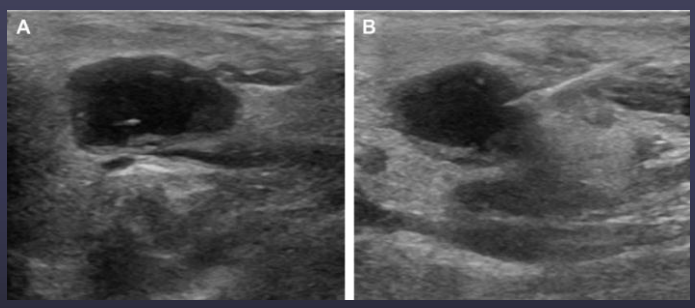
Klinik N0 hastalıkta PET/BT ye göre yaklaşım

PET (-) ise
NPV: % 96

T 1-2	T3-4
Boyun disseksiyonu yapılmayabilir	Boyun disseksiyonu yapılır
	PET/CT boyun disseksiyon kararını değiştirecek doğrulukta değildir

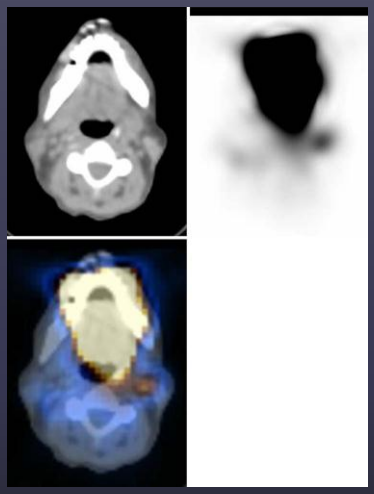
USG-FNA

- Sensitivite % 43-89
- Spesifisite % 98
- Nondiagnostik % 5-16



Sentinel lenf nodu

- N0 ve erken evre
  - Preop lenfosintigrafi
  - İntraoperatif mavi boya
  - Gamma probe
- Orta hat ve ipsilateral N+ ise
  - Karşı taraf için
- NPV % 95
- Sensitivite % 95

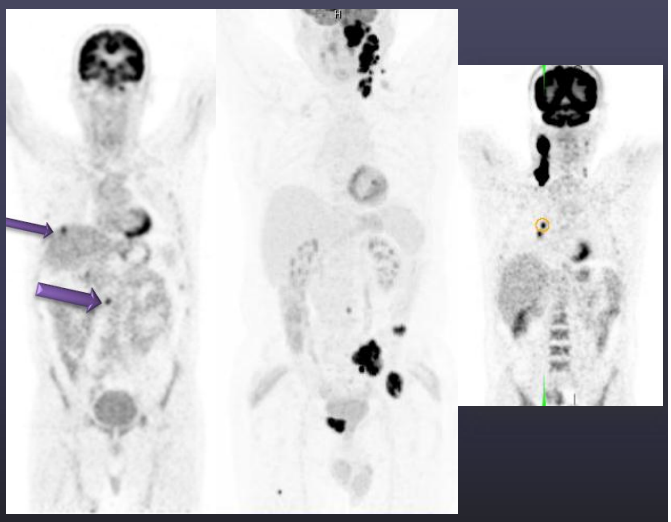


SPECT/CT

Uzak Metastaz

Uzak Metastaz

- Metastaz alanları
  - Akciğer
  - Kemik
  - Karaciğer
- İkinci primer
  - Baş boyun
  - Akciğer
  - Özefagus



Uzak metastaz saptama

- 18FDG-PET/CT
  - % 13.7
  - Olgu sayısı: 1147
  - Meta-analiz:
  - Sensitivite 0.83
  - Spesifisite 0.96
- Geleneksel yaklaşım: %44 % 96

Laryngoscope. 2012 Sep;122(9):1974-8.

^{18}FDG-PET/CT for detecting distant metastases and second primary cancers in patients with head and neck cancer. A meta-analysis

Subgroup analysis of ^{18}FDG-PET/CT in the selected studies.

Type of Staging	Study (n)	No. of patients	Sensitivity (95% CI[a])	specificity (95% CI)
Initial staging and restaging				
Initial staging	8	824	0.882 (0.798–0.939)	0.951 (0.932–0.965)
Restaging	5	452	0.888 (0.797–0.947)	0.951 (0.924–0.970)
Nasopharyngeal cancer and all other sites of HNC				
Nasopharyngeal Cancer	6	588	0.881 (0.792–0.941)	0.971 (0.953–0.984)
All Other Sites of HNC	7	688	0.888 (0.803–0.945)	0.933 (0.910–0.952)

G.-Z. Xu et al. / Oral Oncology 47 (2011) 560–565

Nüks-rezidü değerlendirme

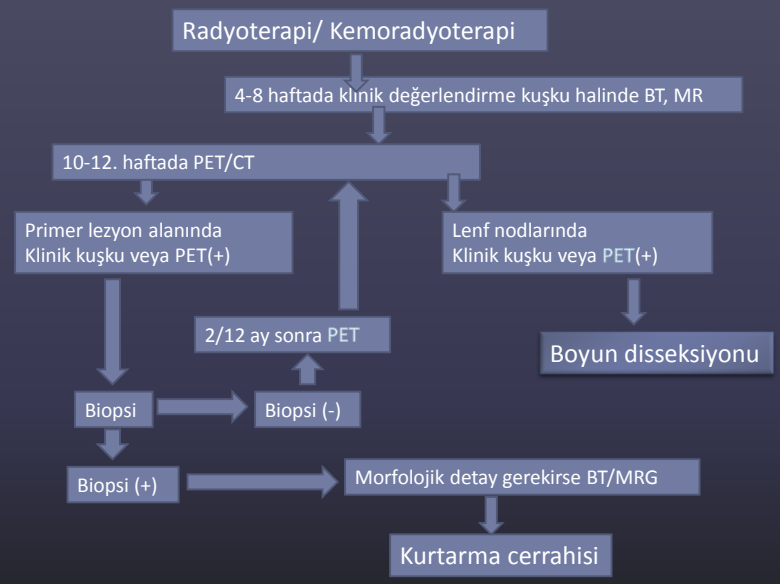
Rezidüel/nüks

PET	Sensitivite	Spesifisite
Tüm alanlar	73%-100%,	57%-100%
Primer lezyon nüksü	94	82
Nodal metastaz nüksü	74	88
BT/MRG	25-100	33-100

Spesifisite

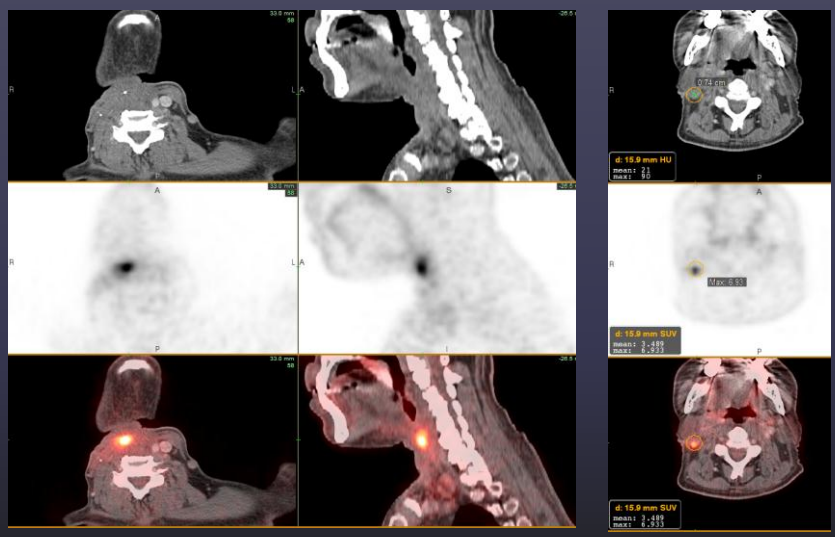
- Lokal 82%
- Bölgesel 95%
- Uzak 95%

Tedavi sonrası yaklaşım



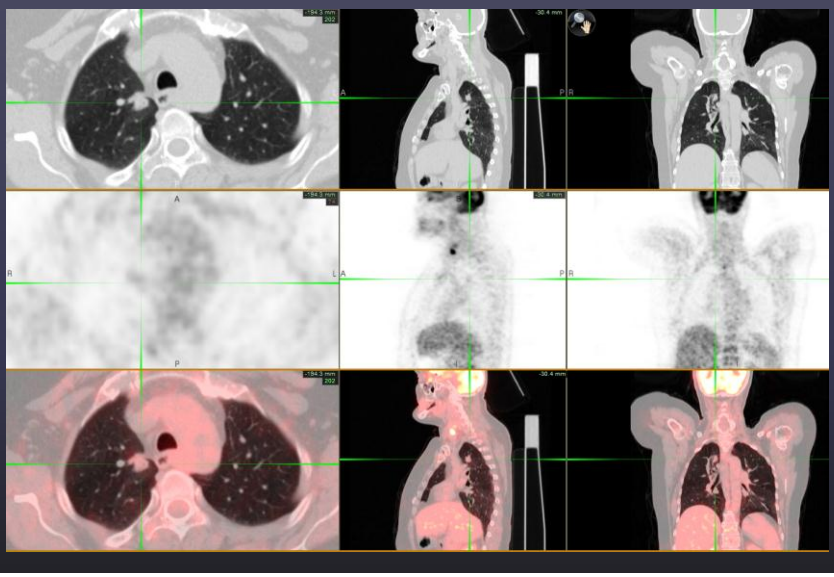
Isles, MG et al. A systematic review and meta-analysis of the role of positron emission tomography in the follow up of head and neck squamous cell carcinoma following radiotherapy or chemoradiotherapy. Clin. Otolaryngol. 2008, 33, 210–222.

Nüks

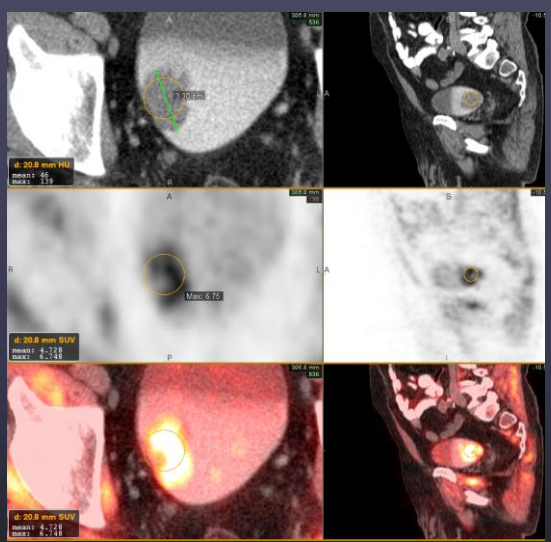


İkinci primer

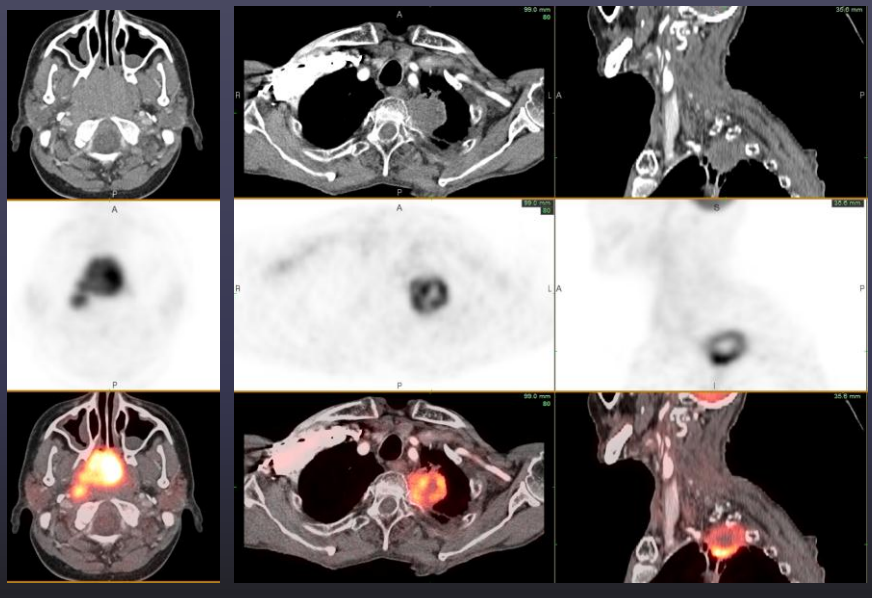
Dil ca, İkinci primer akciğer adeno ca



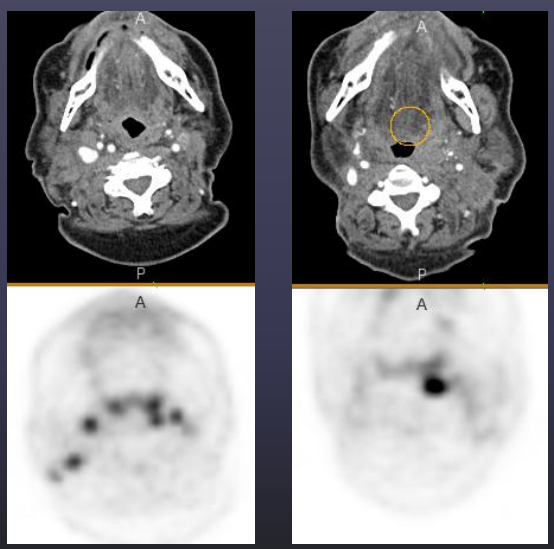
Larinks ca, ikinci primer mesane ca



Nazofarinks ca, ikinci primer akciğer ca



Larinks ca, ikinci primer tonsil ca



Prognoz belirleme

Prognoz belirlemede PET/CT

SUVmax			
Bağımsız gösterge	1 birim SUV artışı % 10 nüks riski artışı	Yüksek SUV: Daha yoğun tedavi gereksinimi? Adjuvan KRT?	Eşik değer?

Torizuka T, Tanizaki Y, Kanno T, Futatsubashi M, Naitou K, Ueda Y, Ouchi Y. Prognostic value of 18F-FDG PET in patients with head and neck squamous cell cancer. Am J Roentgenol. 2009 Apr;192(4):W156-60.

SUVmax prognostiktir

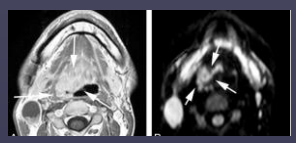
- 26 çalışma
- 1,415 hasta

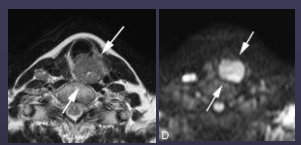
Author	Year	Disease	Follow-up (years)	Endpoints	Patients	Cut-off value
Linecker et al. (2008)	2008	HNC	1.5	OS	19	9.5
Allal et al. (2004)	2004	HNC	4	DFS, OS, LC	120	3.5
Byun et al. (2008)	2008	NHL	3	OS	22	15.4
Suh et al. (2008)	2008	NHL	3	OS	21	5.5
Liao et al. (2009)	2009	Oral	5	DFS, OS, LC	109	19.3
Thorwarth et al. (2006)	2006	HNC	Unclear	LC	12	9.4
Schwartz et al. (2004)	2004	HNC	2	DFS	63	9
Minn et al. (1997)	1997	NPC	3	OS	37	9
Hoshikawa et al. (2009)	2009	HNC	2	LC	51	7
Roh et al. (2007)	2006	HNC	2	DFS	34	4
Okada et al. (1994)	1994	ML	Unclear	OS	34	DAR* = 8
Kunkel et al. (2003)	2003	Oral	3	OS	44	5.6
Machtay et al. (2009)	2009	HNC	2	DFS, OS	60	9
Döbert et al. (2005)	2005	HNC	Unclear	LC	40	3.9
Xie et al. (2010)	2009	NPC	5	DFS, OS	62	8
Rege et al. (2000)	2000	HNC	3	LC	12	MR# = 1
Kim et al. (2008)	2008	HNC	3	DFS	82	5
Lee et al. (2008)	2008	NPC	3	DFS	41	6.48
Torizuka et al. (2009)	2009	HNC	2	LC	50	7
La et al. (2009)	2009	HNC	2	DFS, OS, LC	85	14.83
Halfpenny et al. (2002)	2002	HNC	2	OS	50	10

J Cancer Res Clin Oncol (2011) 137:1085–1093

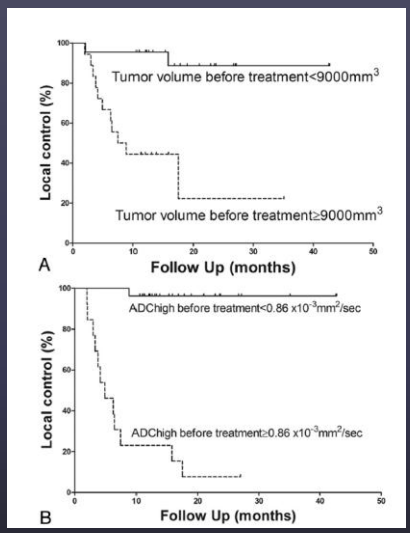
Prognozda Diffüzyon MR

0.63x103 mm2/s





0.99 x103 mm2/s



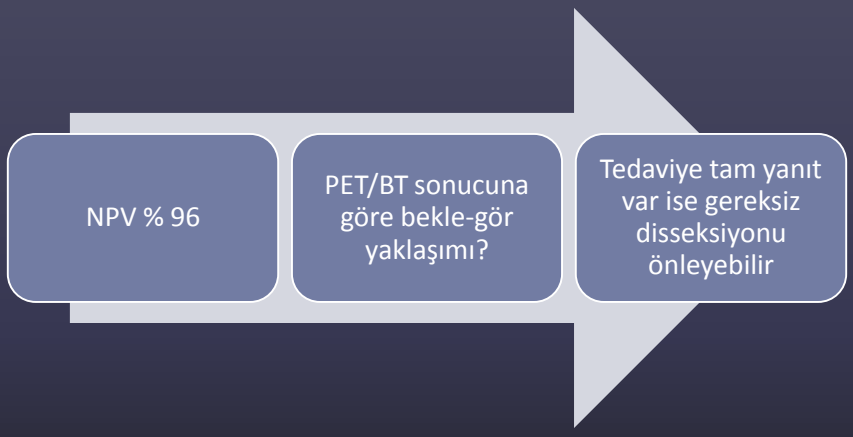
AJNR Am J Neuroradiol 32:1904 –910, Nov, 2011

Tedavi yanıtı değerlendirme

Tedavi sonrasında görüntüleme CT ve MRG

1. Deri ve plastismada simetrik kalınlaşma
2. Yağlı dokuda retikülasyon
3. Retrofaringeal ödem
4. Tükrük bezlerinde boyanma, boyut değişimi
5. Lenfatik doku atrofisi
6. Faringeal mukozal kalınlaşma, boyanma
7. Larinkste kalınlaşma, çevre dokuda yağ artışı

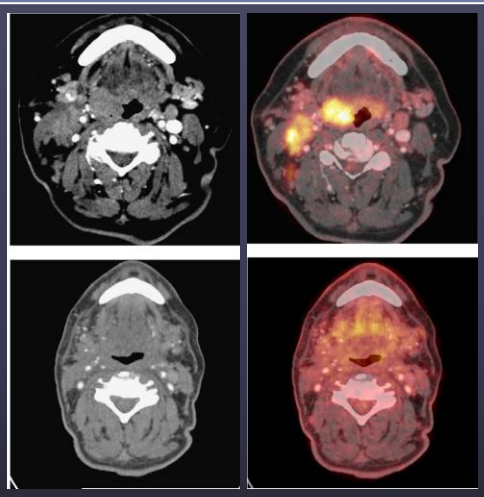
Tedavi yanıtında PET/CT?

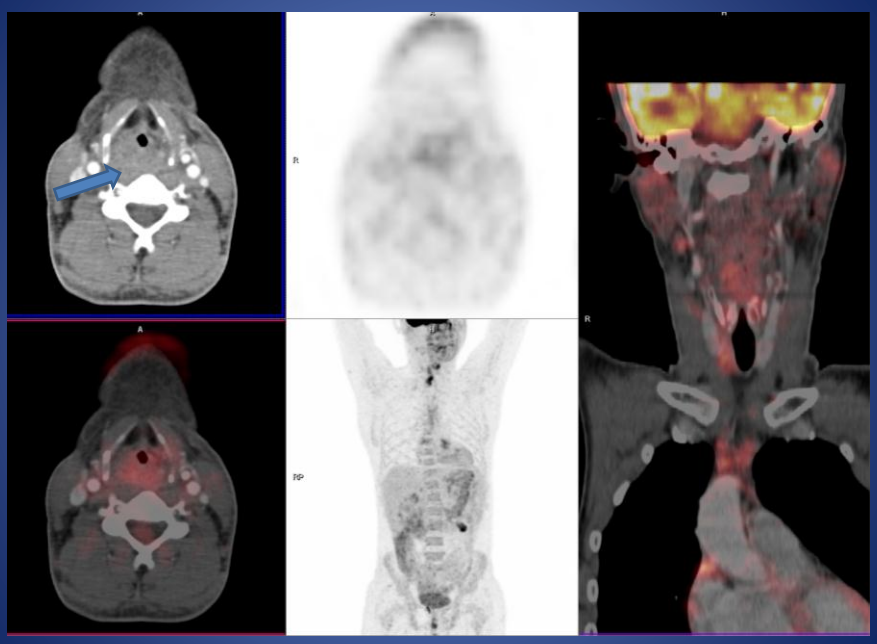


Yanıt ölçütleri

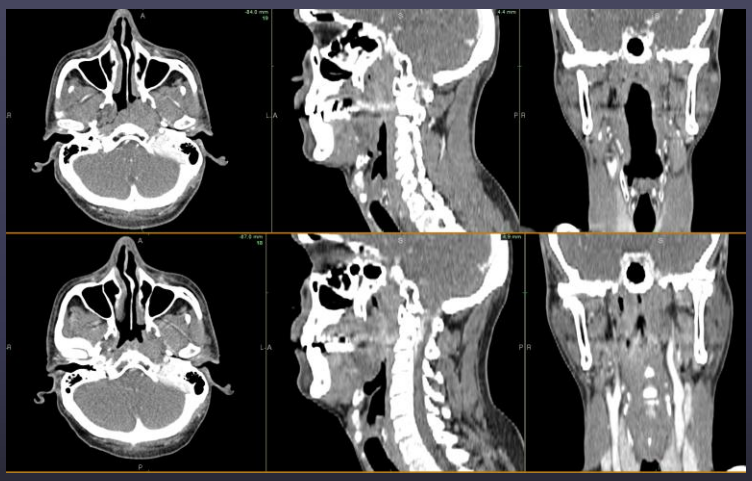
- Boyut
  - RECIST
- Metabolik
  - PERCIST
  - EORTC
- Progresyon
  - PERCIST, SUL
    - > 30%
    - Yeni lezyon
    - TLG >75%
  - 1999 EORTC
    - >% 25
    - Yeni lezyon

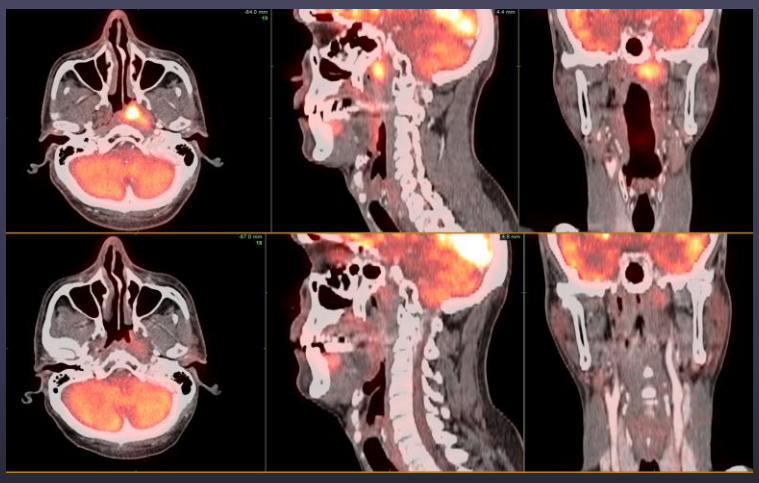
Tedavi yanıtını değerlendirme

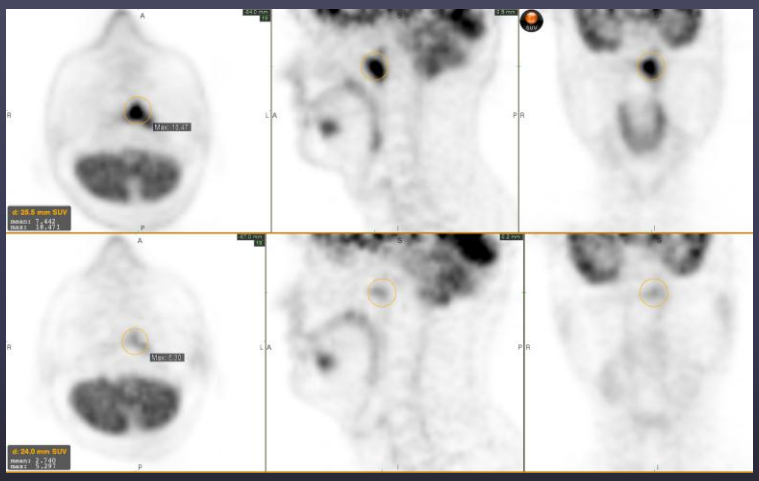




Tedavi öncesi ve sonrası







Tedavi planlama

Radyoterapi planlamada PET/CT

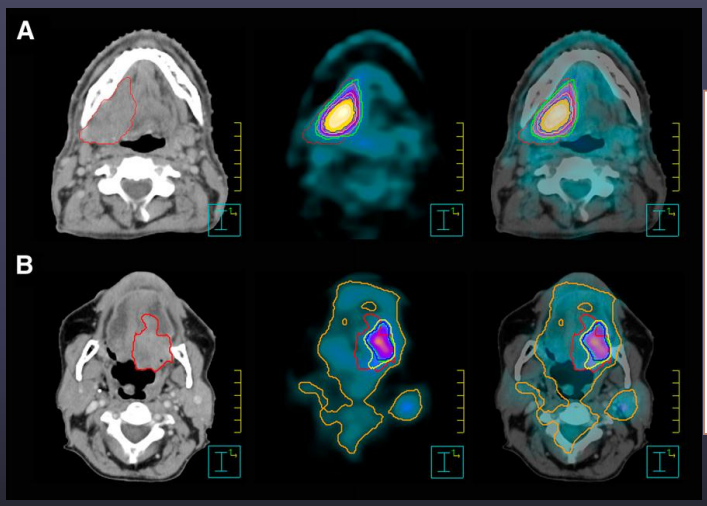
Avantajlar

- 3 boyutlu tanımlama
- % 30 RT alan veya doz azalma
- Toksisitede azalma
- Hipoksi için PET/CT: Cu 64 ATSM

Dezavantajlar

- Standardizasyon yok (% 40?)
- Gözlemciler arası fark yüksek
- Yaşam süresine katkısı bilinmiyor

Radyoterapi planlama: yöntem?



- Turuncu
  - SUVmax: 2.5
- Sarı
  - SUVmax: % 40
- Kırmızı
  - CT
- Yeşil
  - görsel PET
- Mavi
  - Adaptif eşik değer

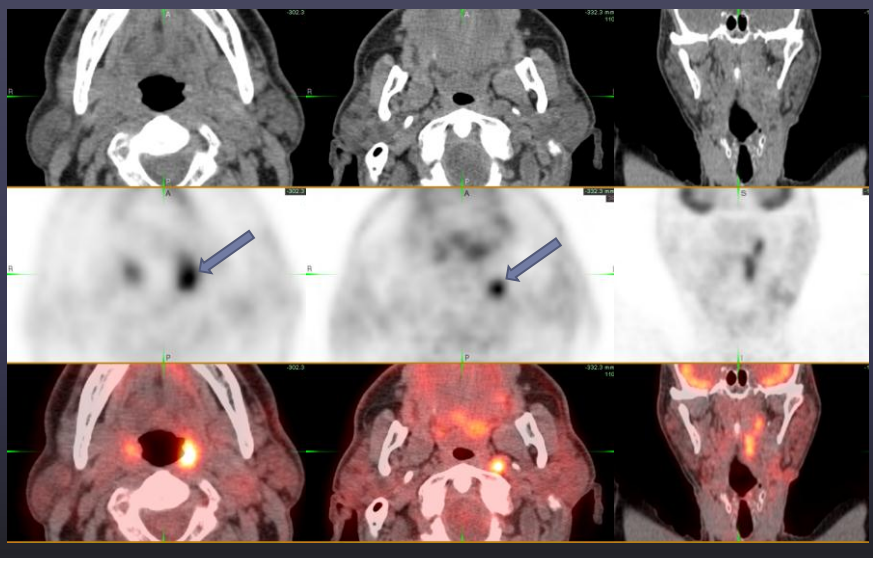
Primeri bilinmeyen baş boyun kanseri

Primeri bilinmeyen kanser

- Panendoskopi ve randomize biyopsi
  - Sensitivite % 40
- Negatif geleneksel çalışma
- FDG-PET
  - Sensitivite % 88 Spesifisite % 75
  - + % 24-30
  - Negatif PET poizitif operatif endoskopi % 16

Rusthoven KE, Koshy M, Paulino AC. The role of fuorodeoxyglucose positron emission tomography in cervical lymph nodes metastases from unknown primary tumor. Cancer 2004;101:2642–9.

Primeri bilinmeyen tümör



Primeri bilinmeyen kanserde algoritma

Diğer yöntemler (-)

PET

PET – ise

panendoskopi+ biopsi

PET + ise

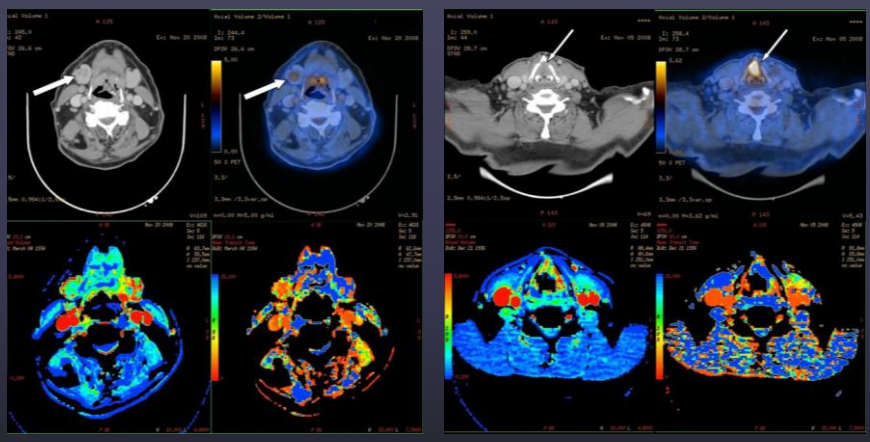
Biopsi

Fleming AJ et al. The clinician's expectations from the use of positron emission tomography/computed tomography scanning in untreated and treated head and neck cancer patients. Curr Opin Otolaryngol Head Neck Surg 2008,16:127–134.

Yeni Yaklaşımlar

CT perfüzyon

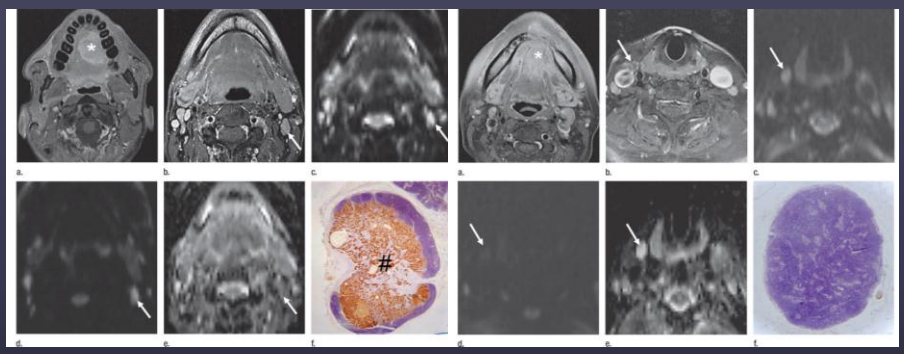
Benign **Malign**



Eur Radiol (2013) 23:163–173

Nodal evrelemede Diffüzyon MR

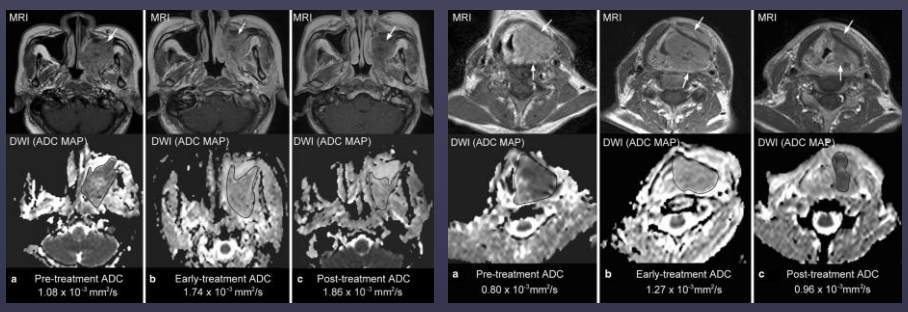
Metastatik lenf nodu **Normal lenf nodu**



Radiology 2009; 251:134–146

Tedavi yanıtında Diffüzyon MR

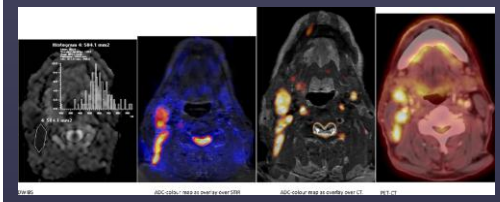
Lokal kontrol **Rezidü tümör**

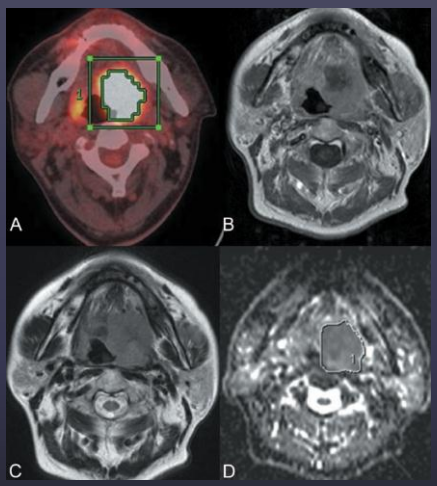


Eur Radiol (2010) 20: 2213–2220

SUVmax ve ADC

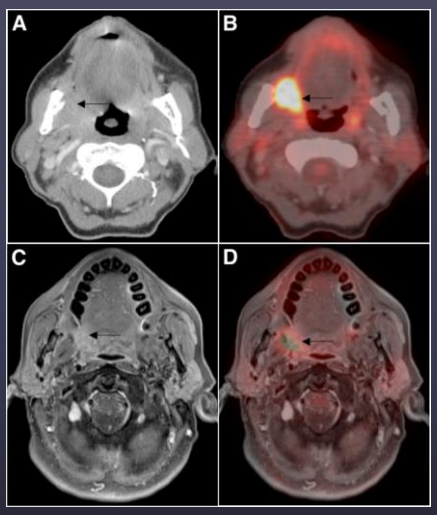
- Ters korelasyon
- Hastalıksız sağ kalım ile ilişkili





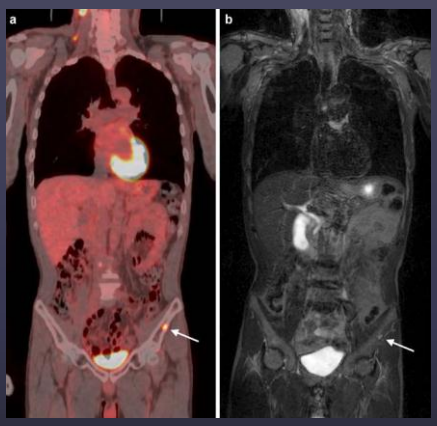
Clin Nucl Med 2012;37: 475–480

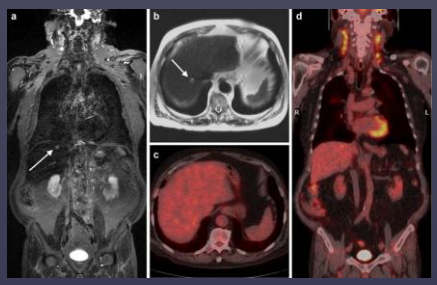
PET/MR



- T evrelemede
  - Yumuşak doku kontrastı
- N evrelemede
  - PET/CT ile benzer
- M evrelemde
  - Beyin ve karaciğer

3T tüm vücut MR

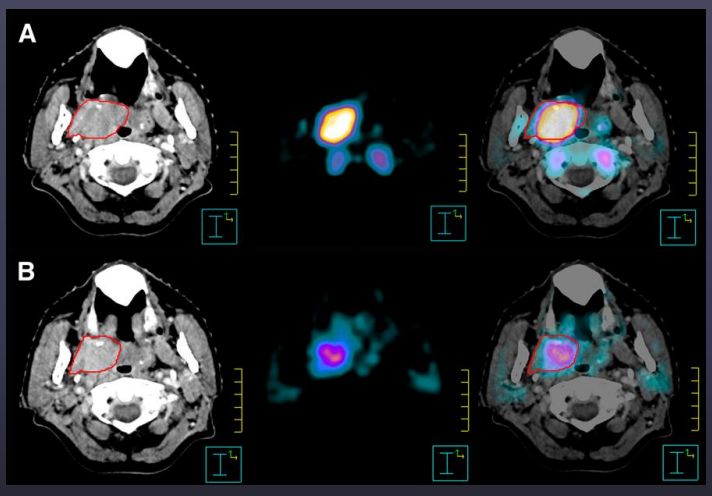




3T MR ve PET/CT
- Olgu bazında benzer sonuçlar
- Sensitivite % 77
- Spesifisite % 98

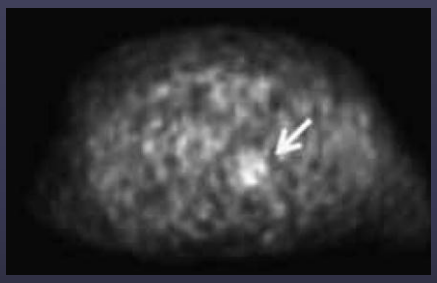
Pretreatment evaluation of distant-site status in patients with nasopharyngeal carcinoma: accuracy of whole-body MRI at 3-Tesla and FDG-PET-CT. Eur Radiol (2009) 19: 2965–2976

DNA replikasyonu: Flor-18 fluorothymidine



Hipoksi: Cu64 ATSM, Flor-18 fluoromisonidazole

Normoksik tümör	Hipoksik tümör



teşekkürler