BÖLÜM 72

Radyoterapi Sonrası Beyinde Radyolojik Değişiklikler Tümör Psödoprogresyonu ve Radyasyon Nekrozu

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GİRİŞ

Radyoterapi (RT) beyin tümörlerinin tedavisinde tek başına ya da cerrahi eksizyon ve kemoterapi ile kombine edilerek kullanılmaktadır (1). Yüksek dereceli glial tümörlerde RT uygun hastalarda tümörün maksimum güvenli rezeksiyonun ardından kemoterapi ile kombine olarak kullanılmakta iken beyin metastazlarının tedavisinde tek başına stereotaktik radyocerrahi (stereotactic radiosurgery-SRS) ya da tüm beyin RT (whole brain radiotherapy-WBRT) şeklinde uygulanabilmektedir (2,3). Ayrıca ekstraaksiyel baş boyun tümörleri ve intrakranial ekstraakisyel tümörlerin tedavisinde uygulanan RT de lezyonun lokalizasyonuna ve ışınlama sahasına bağlı olarak beyinde radyasyon hasarına neden olabilmektedir (4).

Radyoterapi tekniklerindeki gelişmelerle birlikte beyin tümörü olan hastaların sağ kalımı uzamakta ve bu da daha fazla hastanın radyasyonun geç dönem etkileri ile karşılaşmasıyla sonuçlanmaktadır. Amerika Birleşik Devletleri'nde her yıl yaklaşık 100.000 primer beyin tümörü ve beyin metastazı hastası herhangi bir düzeyde radyasyon ilişkili beyin hasarı gelişecek sağkalıma (6 aydan fazla) sahip olmaktadır (5).

Beyinde radyasyona bağlı gelişen değişiklikler farklı zaman aralıklarında farklı mekanizmalarla ortaya çıkmaktadır. Bu değişikliklerin radyolojik bulgularının doğru şekilde değerlendirilmesi tedavinin bir sonraki basamağının doğru şekilde planlanabilmesi için oldukça önemlidir.

Manyetik Rezonans Görüntüleme (MRG) beyin tümörü olan hastaların takibinde en sık kullanılan görüntüleme yöntemidir. Beyinde radyasyona ikincil değişikliklerin tümör rekürrensinden ayırt edilmesinde MRG ile birlikte Pozitron Emisyon Tomografi/ Bilgisayarlı Tomografi (PET/BT) ve Tek Foton Emisyon Bilgisayarlı Tomografi (SPECT) 'den de faydalanılmaktadır.

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Tablo 2: Radyasyon nekrozu ve tümör progresyonu ayrımı

Görüntüleme Yöntemi	Radyasyon Nekrozu	Tümör Progresyonu
Konvansiyonel MRG	T1/T2 uyumsuzluğu	T1/T2 uyumu
DAG/DTG	Difüzyon kısıtlanması yok ADC daha yüksek FA düşük	Difüzyon kısıtlanması var ADC daha düşük FA yüksek
Perfüzyon MRG	rCBV ↓	rCBV↑ Ktrans ↑
MRS	NAA/Cr ↑, Cho/Cr↓	Cho/Cr ve Cho/NAA ↑
LQ	<0.3	>0.6
PET/SPECT	Metabolik aktivite yok/ radyofarmasötik tutulumu yok	Metabolik aktivite/ radyofarmasötik tutulumu ↑

DAG:difüzyon ağırlıklı görüntüleme, DTG: difüzyon tensor görüntüleme, ADC: görünür difüzyon katsayısı, FA: fraksiyonel anizotropi, MRG: manyetik rezonans görüntüleme, rCBV: rölatif beyin kan volümü, NAA: N-asetil aspartat, Cho:kolin, Cr: kreatin, LQ: lezyon katsayısı MRS: manyetik rezonans spektroskopi, PET: pozitron emisyon tomografi, SPECT: tek foton emisyon bilgisayarlı tomografi

SONUÇ

Tedavi sonrası görüntülemelerin doğru şekilde değerlendirilmesi RT alan beyin tümörü hastalarında tedavinin yönlendirilmesi açısından oldukça önemlidir. RT alan hastalarda tedavi sonrasında yeni kontrastlanma alanları sıklıkla görülmektedir. Bu görünüm radyasyon nekrozu, psödoprogresyon, tümör progresyonu ya da bunların bir arada bulunduğu durumları işaret edebilir. Tanı için tanımlanan kriterler bulunmakla birlikte konvansiyonel görüntüleme yöntemleri ile doğru tanıya gitmek genellikle zordur. Altın standart tanı yöntemi biyopsi ve histopatolojik analizdir. Ancak teknik olarak ve hasta açısından zorlukları göz önüne alındığında sık tercih edilmemektedir. MR spektroskopi, DAG, perfüzyon MR, PET ve SPECT kendi kısıtlılıklarına rağmen tanıya büyük katkıda bulunmaktadır. Bu yöntemlerin güçlü ve zayıf yanlarını göz önünde bulundurarak olgu bazında değerlendirme yapılmalıdır.

AKILDA TUTULACAKLAR

- Psödoprogresyon; tedavi sonrasında genellikle 3-6 ayda ortaya çıkarken radyasyon nekrozu ise genellikle tedaviden 6-12 ay sonra gelişir.
- Korpus kallozum tutulumu ve primer kontrastlanan lezyonun >1 cm uzağında subependimal kontrast tutulumunun olması gerçek progresyon lehinedir.
- Tedavi öncesi kontrastlanmayan lezyonun kontrastlanması, cerrahi alanın uzağında lezyon gelişimi, korpus kallosum ve periventriküler beyaz cevher tutulumu, "İsviçre peyniri", ya da "sabun köpüğü" şeklinde nodüler kontrastlanma paternleri ise radyasyon nekrozunu akla getirmelidir.
- Tümör progresyonunda neoanjiyogeneze bağlı perfüzyon artışı (rCBV, Ktrans) beklenirken psödoprogresyon ve radyasyon nekrozunda beklenmez.
- Tümör progresyonunda Cho/Cr ve Cho/NAA artarken NAA/Cr azalır, psödoporgresyonda ise NAA, Cho, Cho/NAA ve Cho/Cr azalır.
- ADC tümör progresyonunda azalır. Ancak tedavi sonrası değişikliklerin tanısında tek başına yeterli değildir.

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