BÖLÜM 80

GASTROİNTESTİNAL SİSTEMDE KAPSÜL ENDOSKOPİ KULLANIMI

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KAPSÜL ENDOSKOPİNİN GELİŞİMİ VE TARİHÇESİ

İnce bağırsak, doğrudan endoskopik inceleme için büyük ölçüde erişilemez durumdaydı ve yalnızca duodenum, proksimal jejunum ve terminal ileum geleneksel endoskoplarla doğrudan görüntülenebilmekteydi (1). İnce bağırsağın tamamının görüntülenmesi enteroskopların ince bağırsağın sonuna kadar ilerletilmesindeki zorluklar nedeniyle her zaman mümkün olamayabilmektedir (2). Özellikle ince bağırsaktan kaynaklanan tekrarlayan gastrointestinal kanaması olan hastalarda ince bağırsağı incelemek için daha iyi görüntüleme yöntemlerine klinik ihtiyaç duyulması nedeniyle kapsül görüntüleme sistemi geliştirilmiştir (3,4). İlk kapsül endoskopisi 1999'da gerçekleştirildi ve sonrasında 2001'de ABD Gıda ve İlaç Dairesi tarafından Amerika Birleşik Devletleri'nde kullanımı onaylandı (5). İlk kapsül kamerası M2A kapsülü (ağızdan anüse) olarak yayınlandı, sonradan PillCam SB (ince bağırsak) olarak yeniden adlandırıldı (6).

İlk kapsül endoskopi ince bağırsağın incelenmesi için geliştirildikten sonra gastrointestinal kanalın farklı bölgelerinin farklılıkları nedeniyle Given Imaging, Ltd. özofagusa özgü ve kolona özgü kapsüllerini, yani sırasıyla PillCam ESo ve PillCam Colon'u piyasaya sürüldü (7). Bunun gibi Given Imaging Ltd'ye ek olarak; CapsoCam (ABD), Jinshan (Çin), Olympus (Japonya), OMOM (Çin) ve IntroMedic (Kore) kendi endoskopik kapsüllerinin performanslarında önemli iyileştirmeler yapmıştır.

2001'de klinik uygulamada ilk kapsül endoskopun ortaya çıkmasından bu yana; kanama ve lezyonları tespit etmek, inceleme süresini azaltmak, kapsülü veya lezyonu lokalize etmek bağırsak hareketliliğini değerlendirmek için video kalitesini artırmak ve verileri yönetmek için algoritmalar dahil olmak üzere çeşitli yöntemlerle gelişmeye devam etmektedir (8). Kapsül endoskopi günümüzde hala tanı koyma amacıyla kullanılmaktadır.

KAPSÜL ENTEROSKOPİ ÇEŞİTLERİ VE ÖZELLİKLERİ

İnce bağırsak teşhisleri için geliştirilen ilk klinik kapsül olan PillCam SB'nin yetersiz görüş açısı gözden kaçabilecek hassas inceleme gerektiren bazı lezyonların tespitini engellemekteydi. İkinci nesil ince bağırsak kapsülü PillCam SB 2, birinci nesil ince bağırsak kapsülünün sınırlamalarının

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bileceği öngörülmektedir. Antiperistaltik kapsül hareketlerine olanak sağlayacak lokomasyon sistemleri gelişeceği gibi kapsüllerin eksternal oluşturulan manyetik alanlarla yönlendirilebilmesi de mümkündür ve yaygınlaşacaktır (88).

Magnetler kapsüle rehberlik edecek şekilde kullanılıp üst gastrointestinal sistemin görüntülenmesinin kalitesini arttırabilir. Magnetik olarak yönlendirilen kapsüllerin konvansiyonel kapsül endoskopiye göre özofageal varislerin ve Barrett özofagusun değerlendirilmesinde daha üstün olduğuna dair gösterilmiş çalışmalar vardır (89).

Son zamanlarda giderek yaygınlaşan yapay zeka ve derin öğrenme algoritmalarının kullanımı ile özellikle ince bağırsak mukoza değerlendirmesi ve kanama araştırmasının konvansiyonel olarak gastroenterolog tarafından yapılan incelemelere göre daha hızlı ve yüksek sensitivitede yapılabileceği görülmektedir (90).

İrlanda'da yapılan 40 hastalık bir çalışmada yapay zeka destekli programlar yardımı ile tanısal doğruluk oranında ve kalitesinde herhangi bir azalma olmadan daha hızlı okumanın sağlandığı gösterilmiştir (91). Benzer şekilde neoplaziler, erozyonlar, ülserler ve motilite bozuklukları içinde yapay zeka destekli kapsül endoskopi uygulamaları zaman ve yüksek doğruluk oranı ile tespit sağlayabilirler ancak hala ileri çalışmalar ile geliştirilip desteklenmesine ihtiyaç duyulmaktadır (92, 93).

Geleneksel kapsül endoskopinin klinik pratikte kullanımı yaygınlaşmakla birlikte girişimsel işlem yapılamaması ve işlem süresince pil süresine bağlı dayanıklılık gibi sorunları devam etmektedir. Bu yüzden kapsüller tam olarak fleksible endoskopinin yerini alamamaktadırlar. Son yıllarda mikroelektromekanik sistemler ve yapay zekâ teknolojilerindeki gelişmeler gelecek jenerasyonda kapsül robotların gelişimi için yeni imkanlar getirmiştir. Bunlar arasında daha uzun süreli görüntüleme sağlayan ve daha uzun süre dayanan kapsüllerin geliştirilmesi ile yapay zeka uygulamaları kullanılarak daha hızlı ve kısa sürede okuma sağlanması gelmektedir. Uzaktan manuel olarak kapsüllerin kontrol edilip pozisyonunun kavite içerisinde değiştirilmesine imkan tanıyan sistemler ile hem görüntüleme sağlanıp hem de lezyonlara müdahale edilebilecektir (94).

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