Amplitude-Modulated Radiofrequency Electromagnetic Fields (AM RF-EMF) for Cancer Treatment

Effective: October 1, 2024

Next Review: September 2025
Last Review: September 2024

IMPORTANT REMINDER

Medical Policies are developed to provide guidance for members and providers regarding coverage in accordance with contract terms. Benefit determinations are based in all cases on the applicable contract language. To the extent there may be any conflict between the Medical Policy and contract language, the contract language takes precedence.

PLEASE NOTE: Contracts exclude from coverage, among other things, services or procedures that are considered investigational or cosmetic. Providers may bill members for services or procedures that are considered investigational or cosmetic. Providers are encouraged to inform members before rendering such services that the members are likely to be financially responsible for the cost of these services.

DESCRIPTION

Amplitude-modulated radiofrequency electromagnetic fields at tumor-specific frequencies is intended to treat advanced cancer.

MEDICAL POLICY CRITERIA

Use of amplitude-modulated radiofrequency electromagnetic fields (AM RF-EMF) is considered **investigational.**

NOTE: A summary of the supporting rationale for the policy criteria is at the end of the policy.

CROSS REFERENCES

1. Tumor Treating Fields Therapy, Durable Medical Equipment, Policy No. 85

BACKGROUND

ADVANCED CANCER

Cancer that cannot be cured is referred to as advanced cancer. Advanced cancer includes cancer that has begun to spread but has not grown apart from the organ it started in (locally advanced), as well as cancer that has spread to other parts of the body (metastatic cancer). While advanced cancer cannot be cured, treatments may offer control by halting or slowing tumor growth.[1] AM RF-EMF has been studied most often in people with advanced hepatocellular carcinoma (HCC).

Hepatocellular Carcinoma

HCC is one of two major types of liver cancer. HCC is relatively uncommon in the United States but is the third leading cause of cancer deaths worldwide. In the U.S., the incidence of HCC is increasing, primarily due to the rise in Hepatitis C virus infections. Left untreated, the prognosis of advanced HCC is typically less than six months. Child-Pugh scores are used to measure liver function in people with HCC. Treatment of locally advanced or metastatic HCC includes transarterial embolization (TAE) and transcatheter arterial chemoembolization (TACE) for locally advanced disease. First-line and second-line systemic treatments for locally advanced or metastatic HCC include immunotherapy (e.g., checkpoint inhibitors) and targeted therapy (e.g., multikinase inhibitors), either alone or in combination.[2]

Advanced Cancers other than Hepatocellular Carcinoma

Researchers have investigated the potential of AM RF-EMF to treat advanced cancers other than HCC, including breast, colorectal, and prostate cancer. These studies have been limited to trials performed to identify tumor-specific radiofrequencies and single case reports of AM RF-EMF use.[3, 4]

AMPLITUDE-MODULATED RADIOFREQUENCY ELECTROMAGNETIC FIELDS

Cancer treatment using amplitude-modulated radiofrequency electromagnetic fields (AM RF-EMF) at tumor specific frequencies consists of the systemic delivery of low-level radiofrequency electromagnetic fields via an intrabuccal device coupled with a battery-powered radiofrequency electromagnetic field generator. Amplitude modulation of a 27.12 MHz carrier frequency at tumor-specific radiofrequencies is believed to block tumor growth while having no effect on non-malignant cells.[5] AM RF-EMF has been shown to have “probable efficacy” in advanced (HCC).[6]

The Therabionic P1 and the AutEMdev™ are devices that are used to administer tumor-specific radio frequencies using a metal spoon (antenna) that is placed on the tongue.[7, 8]

REGULATORY STATUS

The Food and Drug Administration (FDA) approved the Therabionic P1 device in September 2023 through the Humanitarian Device Exemption (HDE) process for the treatment of adults aged 18 years and older with advanced hepatocellular carcinoma (HCC) after first and second lines of therapy have failed.[6]

EVIDENCE SUMMARY

SCIENTIFIC EVIDENCE

No systematic reviews or randomized controlled trials that assessed amplitude-modulated radiofrequency electromagnetic fields (AM RF-EMF) for the treatment of any condition were

identified. Therefore, this evidence review will address the available evidence, consisting of nonrandomized studies.

Nonrandomized Studies

Capareli (2023) published a feasibility study of AM RF-EMF using the AutEMdev device.[9] The study included adults with HCC (n=66) and healthy volunteers (n=51) who were exposed to RF-EMF during part one, or AM RF-EMF during part two of the study. A cohort of people with HCC was derived from hospital electronic medical record data to use as historical controls (n=45). Adults with HCC were treated once and then invited to repeat treatment every 2-4 weeks, with or without other treatments. Healthy adult volunteers had one exposure procedure only. The AutEMdev delivered RF-EMF's with a carrier frequency of 27.12 MHz and amplitude modulation at frequencies between 10 Hz and 20kHz. The primary study endpoints were safety and hemodynamic variability induced by EMF exposure. Grade one somnolence was observed in one person with HCC and one volunteer. Hemodynamic variability was measured with beat-to-beat heartrate variability. Hemodynamic signals of interest occurred more frequently in people with HCC than in healthy volunteers ($p<0.0001$) and correlated with amplitude modulation frequencies, but the significance of this finding is uncertain. Median OS was 11.3 months which was significantly longer than the historical cohort (5.2 months; $p<0.0001$). Compared to baseline through four exposures to RF-EMF, most people with HCC had stable or improved European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC ALA-C30) scores. The authors concluded that RF-EMF is safe and QOL can be maintained or possibly improved with the treatment. Limitations include that treatments in addition to RF-EMF were not controlled for and AM RF-EMF efficacy was not directly assessed.

Costa (2011) published a phase I/II single-group open label study to assess the safety and effectiveness of AM RF-EMF in 41 people with advanced (Child-Pugh A or B) HCC.[10] After an initial treatment in the clinic, treatments were self-administered by subjects in their homes. The treatment schedule was 60 minutes of sequential emission of 194 modulation frequencies three times per day. The primary endpoint was proportion of participants who were progression-free at six months. Secondary endpoints were progression-free survival (PFS) and overall survival (OS). Tumor measurements based on imaging were performed at baseline and every eight weeks. Fourteen of 41 subjects (34.1%) had PFS at six months. Median PFS was 4.4 months (95% CI 2.1-5.3) and median OS was 6.7 months (95% CI 3.0-10.2). Treatment response was assessed with imaging in 28 subjects. Four (9.8%) demonstrated partial response, 16 (39%) had stable disease of at least 12 weeks duration, and 8 (19.5%) developed progressive disease. The reported treatment related adverse effects were grade 1 oral mucositis in one subject and grade 1 somnolence in one subject. The authors concluded that the study findings are encouraging and warrant further investigation into the potential for AM RF-EMF in the treatment of HCC.

Blackstock (2021) published a pooled case-series that included the 41 participants in the Costa (2011) study as well as 18 real-world patients with advanced HCC.[5] The study compared treatment with the Therabionic P1 device to historical controls who received standard therapy through the control arm of pharmacologic randomized controlled trial (RCT). Unlike the phaseI/II study, the real-world participants included Child-Pugh C disease. Similar to the results published by Costa (2011), the study reported a median OS of 6.67 months and an 11.1% (2 subjects) partial response rate. Subjects treated with the AM RF-EMF who had Child-Pugh A disease had a significantly longer OS than 271 historical controls ($p=0.0375$). When

comparing OS in subjects with Child-Pugh B HCC treated with AM RF-EMF to subjects with Child Pugh B disease in the treatment arm of the pharmaceutical trial, the difference was not significant (p=0.55). The authors concluded there is evidence of a probable survival benefit with AM RF-EMF using the Therabionic P1 device. Limitations of the study include selection bias and small sample size.

Section Summary

Research on the use of amplitude-modulated radiofrequency electromagnetic fields (AM RF-EMF) to treat cancer is limited to preliminary studies focused on safety and potential efficacy. Well-designed trials that control for important variables (e.g., concurrent therapy) and compare AM RF-EMF to a sham intervention or other therapies are necessary to understand whether AM RF-EMF is an effective treatment for advanced cancer.

PRACTICE GUIDELINE SUMMARY

No guidelines were identified that addressed AM RF-EMF for any indication, including the National Comprehensive Cancer Network (NCCN) guidelines for HCC.[11]

SUMMARY

There is not enough research to show that amplitude-modulated radiofrequency electromagnetic fields can improve health outcomes for people with cancer. Evidence-based clinical practice guidelines for cancer treatment do not address amplitude-modulated radiofrequency electromagnetic fields. Therefore, the use of amplitude-modulated radiofrequency electromagnetic fields is considered investigational.

REFERENCES

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CODES

Codes	Number	Description
CPT	None	
HCPCS	E0767	Intrabuccal, systemic delivery of amplitude-modulated, radiofrequency electromagnetic field device, for cancer treatment, includes all accessories

Date of Origin: *September 2024*