Electrochemotherapy: Shocking Advances in Research and Therapy

By lecturerDr Safaa S. Mezban

Electrochemotherapy is a medical procedure that involves the use of **electric pulses** to enhance the efficacy of chemotherapy drugs. This technique has been used for several decades, and it has shown promising results in treating **various types of cancer**.

History of Electrochemotherapy

The concept of **electrochemotherapy** was first introduced in the 1980s by **Dr. Lluis Mir**, a Spanish oncologist. He discovered that when electric pulses were applied to tumors, the cell membrane became more permeable, allowing chemotherapy drugs to enter the tumor more easily.

Over the years, researchers have refined the technique and developed new devices that can deliver the electric pulses more precisely. Today, electrochemotherapy is an **established treatment option** for several types of cancer, including melanoma and breast cancer.

Current State of Electrochemotherapy

Currently, electrochemotherapy is being used as a **complementary treatment** for cancer patients who have **not responded well** to traditional chemotherapy or radiation therapy. The procedure is **minimally invasive** and can be performed on an outpatient basis.

In addition to its use in cancer treatment, researchers are exploring the potential of electrochemotherapy in other areas, such as **gene therapy** and **drug delivery**. The technique has also shown promise in treating non-cancerous conditions, such as skin diseases and infections.

Future Applications of Electrochemotherapy

As technology continues to advance, the **potential applications** of electrochemotherapy are **expanding**. Researchers are exploring the use of nanotechnology to deliver chemotherapy drugs directly to cancer cells, **enhancing** the effectiveness of the treatment while **minimizing** side effects.

Other areas of research include the use of electrochemotherapy in **combination with immunotherapy**, which could potentially **boost** the immune system's ability to fight cancer. Additionally, there is **ongoing research** into the use of electrochemotherapy in **veterinary medicine**, particularly in the treatment of skin tumors in pets.

Role of Electrochemotherapy in Research

Electrochemotherapy has played a **significant** role in **cancer research**, particularly in the **development** of new chemotherapy drugs and drug delivery systems. The technique has also been used to **study the mechanisms** behind the effectiveness of chemotherapy and how electric pulses can enhance drug uptake in tumors.

Furthermore, electrochemotherapy has paved the way for the **development** of other **electroporation-based techniques**, such as gene electrotransfer and irreversible electroporation, which are being explored for their potential applications in cancer treatment and other areas of medicine.

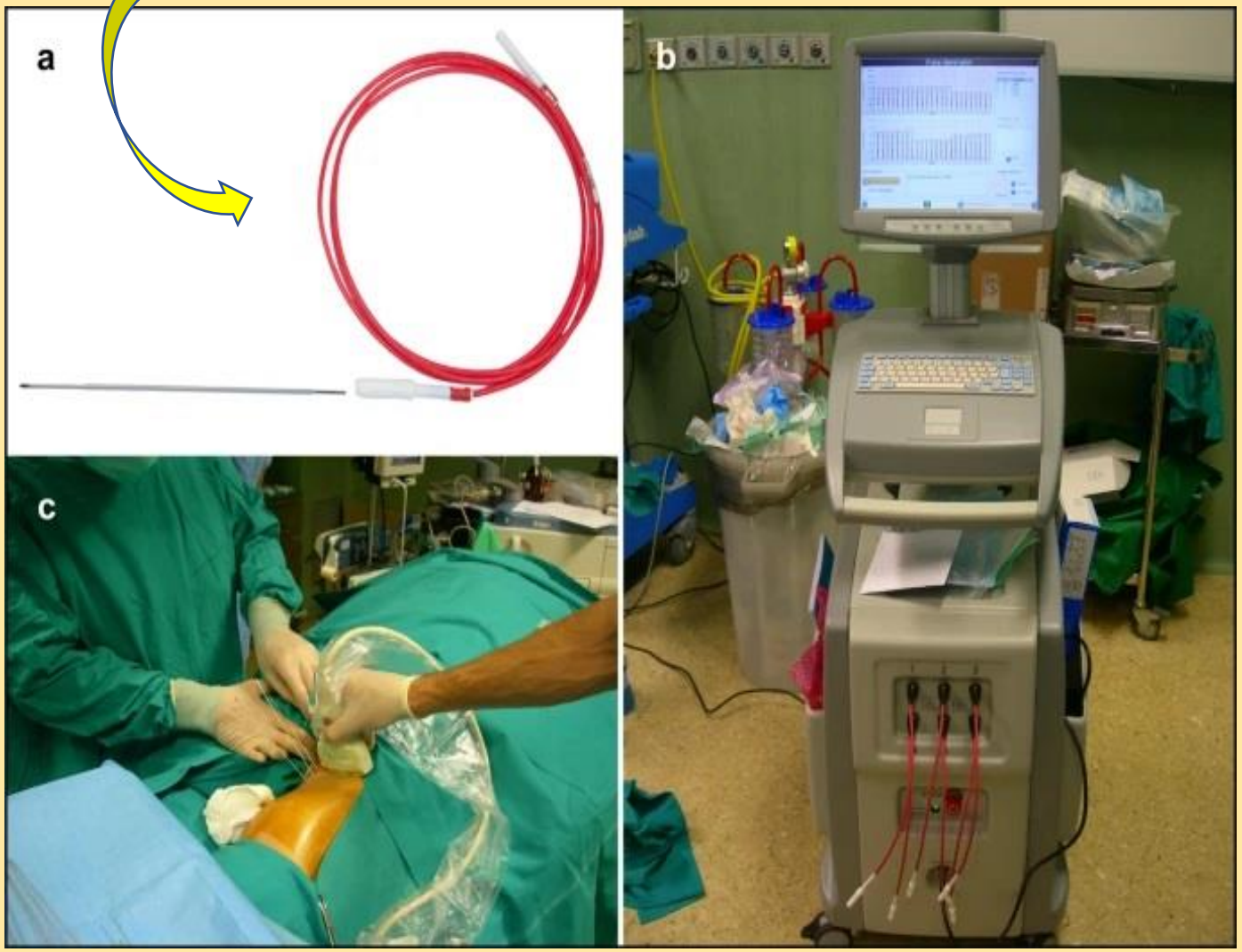
Role of Electrochemotherapy in Therapy

In therapy, electrochemotherapy has provided a new treatment **option** for cancer patients who have exhausted other options. The procedure is generally **well-tolerated** and has **minimal side effects**, making it a **viable alternative** to traditional chemotherapy or radiation therapy.

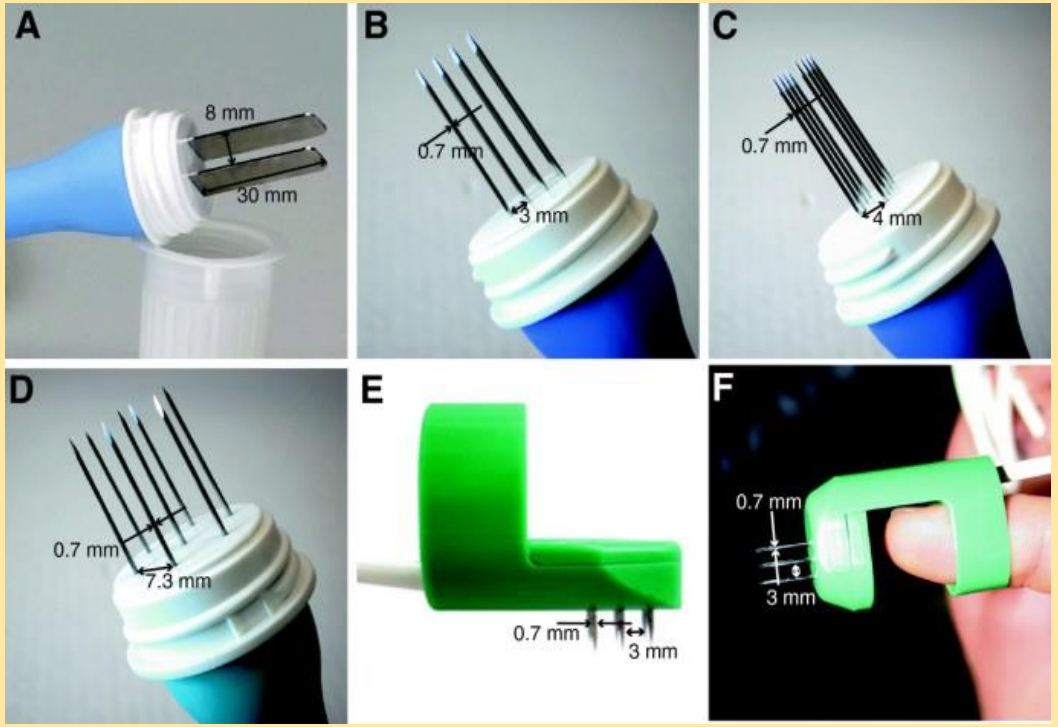
Moreover, electrochemotherapy has the potential to **improve patient outcomes** by **increasing** the effectiveness of chemotherapy drugs and **reducing** the risk of cancer recurrence. As such, it has become an important tool in the fight against cancer.

clinicoporator

An electrode probe. The needle electrode is 1.2-mm thick

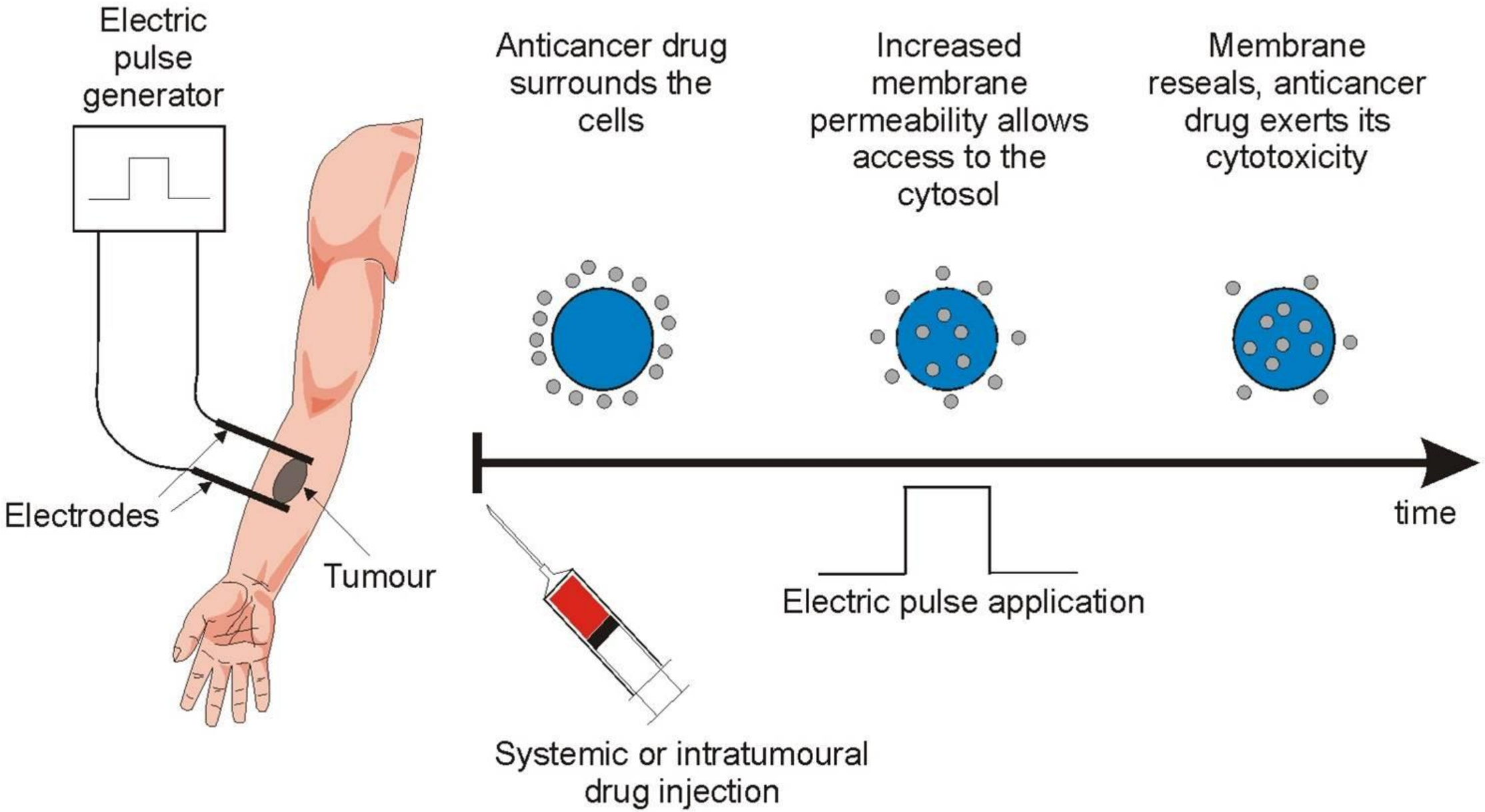


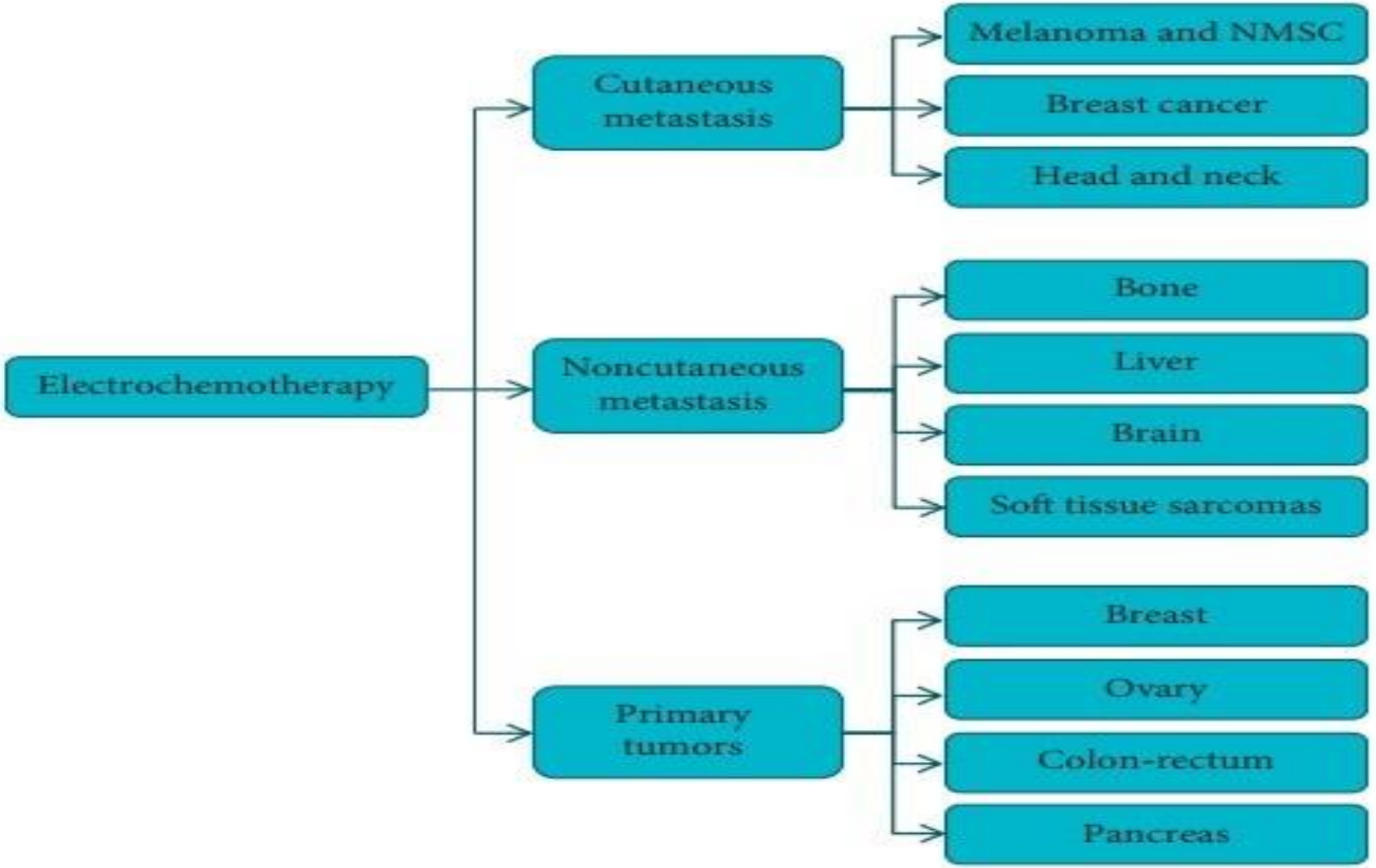
Pulse generator



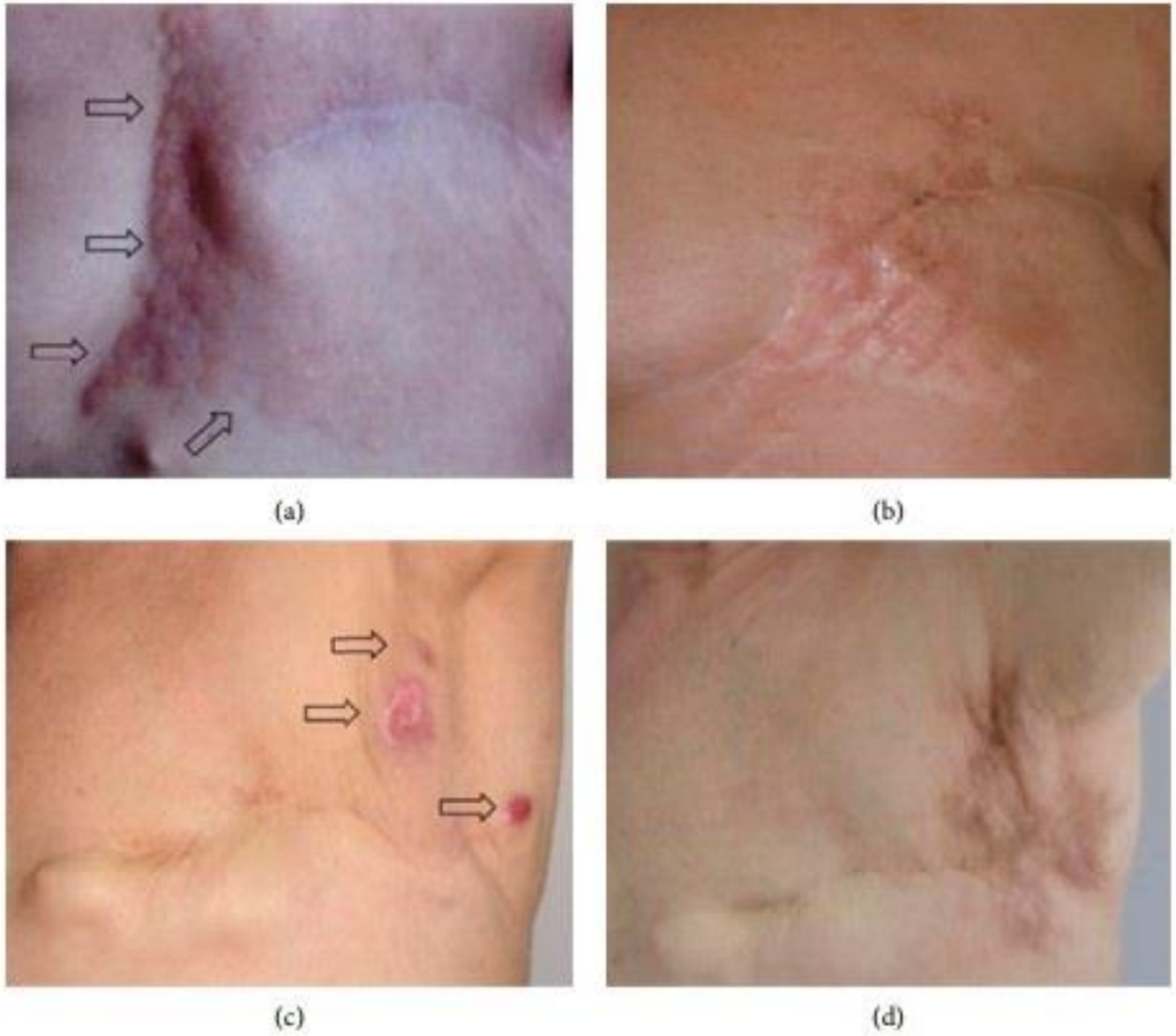
patient with soft tissue sarcoma of the lower limb

Electrochemotherapy





Current and potential application of ECT for tumor treatment.



Skin metastases from breast cancer treated with ECT in two patients. (a, c) Before treatment. (b, d) 1-year follow-up. Arrows contour tumor spread or indicate skin metastases [10].

Advantages of Electrochemotherapy:

1. **Enhanced drug delivery**: ECT uses electric pulses to create temporary pores in the cell membrane, allowing chemotherapy drugs to penetrate the cell more effectively. This leads to a higher concentration of drugs in the tumor, resulting in improved treatment outcomes.
2. **Reduced side effects**: ECT can target the tumor site with high precision, which **reduces** the exposure of healthy tissues to chemotherapy drugs. As a result, patients may experience **fewer** side effects than with traditional chemotherapy.
3. **Potential for combination therapy**: ECT can be used in **combination** with other treatments, such as **radiation** therapy or **immunotherapy**, to enhance their effectiveness.
4. **Suitable for various tumor types**: ECT has shown efficacy in treating a wide range of tumors, including **melanoma**, **head and neck cancer**, and **breast cancer**.

Disadvantages of Electrochemotherapy:

1. **Limited data on long-term outcomes**: Although ECT has shown promising results in the short-term, there is limited data available on its long-term efficacy and safety.
2. **Technical expertise required**: ECT requires specialized equipment and expertise, which may limit its availability in certain areas.
3. **Pain and discomfort during treatment**: The electric pulses used in ECT can cause discomfort or pain during treatment, although this can be managed with local anesthesia or sedation.
4. **Cost**: ECT is a relatively expensive treatment, which may limit its availability in some healthcare settings.

Limitations of Electrochemotherapy:

1. **Tumor size and location**: ECT is most effective for small to medium-sized tumors, and its efficacy may be limited for tumors located in certain areas, such as the lungs or brain.
2. **Patient selection**: Not all patients are suitable candidates for ECT, and **careful patient** selection is required to ensure the treatment is safe and effective.
3. **Electroporation efficiency**: The effectiveness of ECT depends on the ability of the electric pulses to **create** pores in the cell membrane. However, the efficiency of electroporation can be affected by factors such as **tissue composition** and **electrode placement.**

Thank you