Understanding common types and causes of ultrasound probe damage

Ultrasound probes are complex, expensive medical devices that contain fragile active elements. Damage to probes in clinical use is common, with a multicenter study finding that more than 1 in 3 probes were faulty and more than 1 in 8 were not fit for clinical use.[1] In the United States, a 4-year quality control program found an average annual probe failure rate of 13.9%.[2]

Damage can have a range of causes, from dropping or knocking the probe to using incompatible cleaning and disinfection methods. Disruptions in image quality caused by probe damage can have clinical implications, including missed or incorrect diagnoses.[3] Physical damage, such as dents or scratches, can also interfere with cleaning or reprocessing and create a higher risk of infection for patients. In general, ultrasound probes require gentle handling, correct storage and the use of compatible cleaning and disinfection methods to minimize the risk of damage.

Common types of probe damage

Damage can affect any part of an ultrasound probe. The most commonly damaged parts include:

- **Lens**

Studies indicate that between 30-70% of probe faults involve the lens.[1,3] The most common form of lens damage is delamination, where the layers of material making up the transducer detach from one another.[3] Also common are gouge marks or scratches on the lens, particularly when probes are used in needle-guided procedures.[4]

- **Cable and strain relief**

Cracks or breaks in the cable are common, with a Swedish study reporting that 30% of probe failures involved the cable.[2] Damage to the cable or strain relief can result in connectivity issues or loss of imaging capability.[1]

- **Internal elements**

Damage to the sensitive internal elements of an ultrasound probe commonly manifests as image dropout. Dropout was detected in 20% of ultrasound probes in a UK study.[1]

A summary of common types of ultrasound probe damage and their potential causes is shown in Table 1.

Causes of probe damage

Variables that cause damage to an ultrasound probe can generally be divided into two categories:

- **Mechanical stress** (during general handling, cleaning, transport or storage)
- **Incompatible cleaning and disinfection methods**

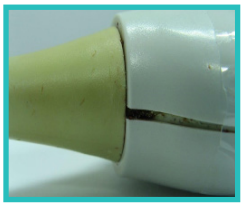
Ultrasound probes are very susceptible to damage from accidental drops or knocks, or careless handling (such as cart wheels running over the ultrasound cable).[5,6] As well as causing cracks in the probe housing or lens, drops or impacts can damage internal elements such as the piezoelectric crystals and have severe effects on image quality.[7,8] Mechanical damage can also be caused by aggressive cleaning and disinfection methods.[4] It is recommended to avoid hospital paper towels and vigorous wiping motions when cleaning.[9]

The use of incompatible cleaning and disinfection methods, incorrect solution strengths, or exposure to chemicals for longer than recommended can all cause damage to plastic surfaces of probes or probe cables.[7,10] Regulatory bodies in some countries have issued formal alerts regarding the risk of damage to plastic surfaces from incompatible disinfectant wipes.[10,11] Wipes containing greater than 70% alcohol can cause damage to the ultrasound transducer footprint, screen, cables and connectors.[12,13] A study in Japan showed that image quality was affected by wiping probes with 80% ethanol wipes.[14]

Conclusion

Damage to ultrasound probes is common and can result from mechanical stress, exposure to incompatible chemicals/cleaning methods, or a combination of these factors. To reduce the risk of damage and prolong the lifespan of your probe, use only ultrasound manufacturer approved cleaning and disinfection methods and ensure gentle handling and correct storage of the probe is implemented by your facility.

Table 1. Common types of ultrasound damage and possible causes

Type of damage	Images	Possible causes of damage
Lens damage (e.g. delamination, punctures, scratches, drying out)	 	• Abrasive cleaning methods (e.g. brushes, paper towels) • Over-cleaning • Use of incompatible cleaning/disinfection methods • Use of alcohol wipes • Gouging during needle-guided procedures • Dropping or knocking the probe • Improper probe storage conditions • Wear and tear over time
Cable and strain relief damage (e.g. tears in cable, separation of strain relief)	 	• Careless handling (e.g. running over cable with cart wheels, pulling on cable) • Use of incompatible cleaning/disinfection methods • Use of alcohol wipes • Mechanical stress from handling and transport • Wear and tear over time • Incorrect storage or coiling of cable
Damage to probe housing (e.g. cracking, dents)	 	• Dropping or knocking the probe • Use of incompatible cleaning/disinfection methods • Improper probe storage conditions
Oil leakage		• Dropping or knocking the probe • Forceful cleaning methods (e.g. twisting force during wiping or drying) • Wear and tear over time • Use of incompatible cleaning/disinfection methods

Contact us to learn about our probe compatibility programme or for your specific educational needs on ultrasound probe disinfection.

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