

Zhivon Whitepaper 1 · Selecting an External Coaptation Method: Six Options × Five Dimensions

Wuhan Zhiheng Technology Co., Ltd. · Technical Whitepaper · September 2026

Audience: veterinarians, veterinary rehabilitation providers, distributors and procurement teams

Basis: enterprise standard Q/WHZH 001-2026 (publicly filed), peer-reviewed literature and professional organisation resources. This document contains no product test results of its own.

Summary

External coaptation is not a product category — it is a group of methods. The selection sequence should be: diagnosis → region and stability → which directions of motion must be limited → coaptation method → material and specifications → recheck schedule. This whitepaper compares six common methods across five dimensions, summarises what published literature actually shows about material comparison and complications, and lists the declared properties of our sheets as published in our enterprise standard.

1. Choose the method before the material

A common mistake is to ask "which material is better" first and work backwards. Material is only the means of implementing a method: the same low-temperature thermoplastic sheet used for short-term immobilisation and for long-term support requires different measurement, padding and recheck intervals.

Six decision points:

1. What is the diagnosis (fracture type, ligament injury, neurological problem)?
2. How stable is it — is rigid immobilisation required?
3. Which directions of motion must be restricted?
4. How long will it be worn (short-term immobilisation, post-operative protection, long-term support)?
5. Recheck capacity and owner compliance
6. Skin condition and body size — the heavier the patient, the higher the load the device carries

2. Six common external coaptation options

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Option	Structure & fit	Adjustability	Typical use	Main source of risk
Soft bandage	Gauze/elastic wrap	High (rewrappable)	Wound protection, light support	Loosening, moisture, uneven wrap pressure
Splint (rigid bar + bandage)	Rigid bar secured with wraps	Medium	Emergency transport, short-term immobilisation	Technique-dependent, edge pressure
Plaster / fibreglass cast	Full circumferential, sets in place	Low (must be removed and redone)	Where rigid immobilisation is required	Heavy, occlusive, wound not visible, pressure hidden
Off-the-shelf brace	Prefabricated shell + straps, sized	Medium	Long-term wear, chronic support	Sizing mismatch, migration
Custom orthosis	Made from a cast/mould	Medium (adjustment often means return to maker)	Complex or long-term cases	Lead time, adjustment cost
Low-temperature thermoplastic splint	Softened on site and moulded to the contour	Medium-high (same sheet can be reheated within a course)	Contour-critical fit, windowed observation	Depends on professional measurement and moulding

3. Five comparison dimensions — and how to judge them

- Conformity of fit:** custom orthosis > on-site thermoplastic moulding > off-the-shelf brace > cast (fixed once set) > bandage. How to judge: check migration and edge contact both statically and standing.
- Adjustability:** thermoplastic can be reheated and adjusted within the same course; a cast must be removed and redone; a custom orthosis usually goes back to the maker. How to judge: ask "what happens to fit when swelling changes?"
- Weight and ventilation:** thermoplastic sheets are typically thinner and lighter, and can be windowed to observe skin and wounds; casts are heavier and fully occlusive.
- Fabrication and delivery time:** thermoplastic splints can be completed in-clinic; custom orthoses require moulding, fabrication and shipping (days to weeks).
- Risk sources and how they are managed:** every external coaptation method carries pressure-injury, skin and migration risk. What differs is where the risk comes from and how it is monitored.

4. What the published literature actually shows

Cadaveric model study (PMID 29660738)

The study created a mid-diaphyseal tibial fracture model in eight cadaveric canine pelvic limbs and applied either fibreglass or thermoplastic splints to the lateral or cranial aspect of the tibia, comparing construct stiffness and inter-fragmentary motion. The finding direction: stiffness

performance is related to placement and construct configuration — there is no "universal winner" independent of configuration.

(The model is cadaveric; results cannot be extrapolated directly to live clinical outcomes.)

Prospective clinical study (Rosen et al., Front Vet Sci 2022;9:892662)

A prospective evaluation of canine orthosis and prosthesis use grouped complications into three main categories: skin complications (abrasions, hair loss, sores), mechanical device problems, and patient non-acceptance of the device. At least one skin complication was reported within the first 3 months of use in: 9/10 (90%) carpal orthoses, 6/10 (60%) tarsal orthoses, 8/14 (58%) stifle orthoses and 4/7 (58%) prostheses.

The same study notes that, because there was no control group, how much of the observed functional improvement can be attributed to the orthosis is unknown.

(These are third-party study data. Sample, devices and species differ from our product and cannot be used as a performance or efficacy claim for it.)

5. Our declared baseline (from the enterprise standard)

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Item	Requirement	Basis
Tensile strength	≥10 MPa	§4.3.2 (per ASTM D638)
Flexural strength	≥15 MPa	§4.3.2 (per ASTM D790)
Hardness (set)	Shore D ≥50	§4.3.2
Dimensional stability	No visible deformation at −10 °C to 40 °C, RH 10–90%	§4.3.3
Safety	Non-toxic, no irritating odour; no harmful release under normal use; saliva-resistant with no shedding under light chewing	§4.4
Simulated saliva soak	Surface integrity maintained after pH 6.5–7.5, 37 °C, 24 h	§5.4.2
Sampling & inspection	GB/T 2828.1 AQL 1.5; type test every 12 months	§6.1.2 / §6.2
Safety reference standard	GB/T 43839-2024 (Safety technical requirements for companion animal (pet) products), effective 2024-10-01	Enterprise standard, normative references

Sizes: Universal 60 × 100 mm, Large 80 × 120 mm, plus Professional and Professional Large (60 × 100 / 80 × 120 mm); thickness 2.5 ± 0.5 mm. Professional models use a low-allergen medical backing for direct skin contact after appropriate preparation.

Product classification: **health support product, not a medical device.**

6. Selection checklist

1. What is the diagnosis and the stability assessment?
2. Which directions of motion need to be restricted?
3. How long will the device be worn — short-term, post-operative or long-term support?
4. What is the recheck schedule, and what is assessed at each visit?
5. If swelling, migration or skin problems occur, who adjusts the device and how?
6. Who measures and moulds, and which parameters are recorded?

7. How to read the numbers in this document

Three categories of numbers appear here, and they must stay distinct when reused:

1. **Enterprise standard values** — requirements defined in Q/WHZH 001-2026, a publicly filed standard and therefore verifiable. They are *requirements*, not measured results.
2. **Literature values** — third-party research data with study design and sample stated. They do not describe our product's performance.
3. **Product specifications** — manufacturer declarations (sheet dimensions, thickness, classification).

This whitepaper contains no untested "in-use conclusions". Any published test data should state the testing laboratory and report number, together with test conditions and applicable range.

References

1. Rosen S, Duerr FM, Elam LH. Prospective evaluation of complications associated with orthosis and prosthesis use in canine patients. *Front Vet Sci.* 2022;9:892662. doi:10.3389/fvets.2022.892662 (PMC9372342 / PMID 35967994)
2. Evaluating stiffness of fibreglass and thermoplastic splint materials and inter-fragmentary motion in a canine tibial fracture model. PMID 29660738
3. Vet Times: Low temperature thermoplastics used for splinting small animals — vettimes.com
4. VCA Animal Hospitals: Bandage and Splint Care in Dogs — vcahospitals.com/know-your-pet/bandage-and-splint-care-in-dogs
5. GB/T 43839-2024 Safety technical requirements for products used for companion animals (pets)
6. Wuhan Zhiheng Technology Co., Ltd. — Enterprise Standard Q/WHZH 001-2026, Thermoplastic Memory Splint for Pets (Health Support Product)

This whitepaper is technical reference material and does not constitute veterinary advice. Clinical decisions must be made by a licensed veterinarian. The product is a health support product, not a medical device.

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Product photo (actual unit)