# Less-Lethal Shotgun

Version 1.0 · Current · October 2026 · Codebook variable: `I_LessLethalShotgun`

## Definition

A less-lethal shotgun is a dedicated, visually differentiated, or modified 12-gauge shotgun used to fire ammunition specifically designed to transfer kinetic energy to a person without the penetrating mechanism of conventional buckshot or slugs.

This category includes:

- beanbag rounds;
- flexible baton rounds;
- sock rounds;
- rubber or polymer kinetic projectiles designed for 12-gauge platforms; and
- comparable 12-gauge less-lethal impact munitions.

It excludes conventional lethal shotgun ammunition; 37 mm, 40 mm, or ARWEN-type launchers, which are classified as Extended-Range Impact Weapons; and chemical projectiles whose primary intended effect is irritant delivery.

This definition corresponds with the research dataset, where `I_LessLethalShotgun` is coded when an officer fires at least one flexible less-lethal projectile from a 12-gauge shotgun platform. A shotgun that is merely pointed, or one firing conventional lethal ammunition, does not qualify.

## How It Is Designed to Work

Less-lethal shotgun munitions are intended to incapacitate or alter behaviour through blunt kinetic impact rather than firearm penetration.

A typical beanbag or sock round consists of a fabric pouch containing lead shot or another dense material. After leaving the barrel, the projectile is intended to flatten or spread on impact, increasing the surface area over which its kinetic energy is transferred.

The intended effects may include:

- intense localized pain;
- temporary motor dysfunction;
- distraction;
- interruption of aggressive behaviour;

- loss of balance;
- localized muscle injury sufficient to inhibit movement; or
- brief incapacitation permitting officers to approach and restrain the subject.

The design objective is to deliver enough energy to alter behaviour while reducing the probability that the projectile penetrates the body or causes catastrophic trauma – a balance that is inherently difficult, because the same kinetic energy that makes a round capable of stopping or interrupting behaviour also creates the possibility of:

- deep soft-tissue injury;
- fracture;
- internal-organ injury;
- vascular injury;
- ocular trauma;
- intracranial injury; or
- penetration.

Less-lethal shotgun rounds are therefore better understood as reduced-lethality kinetic weapons, not harmless projectiles.

## Evidence of Effectiveness

### Overall assessment

Evidence strength is low-to-moderate for operational effectiveness and moderate-to-strong for injury mechanism and serious-harm potential. The literature on less-lethal shotgun munitions is unusually asymmetric: there are numerous clinical case reports, trauma series, imaging studies, and biomechanical studies documenting what these rounds can do to the human body, but far fewer peer-reviewed studies addressing how often a less-lethal shotgun successfully resolves a police encounter without requiring additional force, and this is a major limitation.

### Operational effectiveness

Published medical literature confirms that beanbag and similar projectiles can produce sufficient blunt force to interrupt or disable behaviour. However, the strongest peer-reviewed studies generally begin with injured patients rather than with all police deployments, which creates a denominator problem: a trauma-centre study can report that a beanbag round produced a splenic rupture, pneumothorax, or penetrating injury, but it typically cannot say whether those severe injuries occurred once in every twenty deployments or once in every ten thousand. The injury literature therefore cannot be converted directly into a probability of harm per deployment.

### Evidence of failure

Published police and legal cases also demonstrate that successful impact does not guarantee incapacitation. A person may:

- absorb the impact and continue advancing;
- be struck in a non-incapacitating location;
- experience pain without losing motor function;
- remain capable of using a weapon; or
- require repeated rounds or escalation to another force option.

This is especially important in edged-weapon encounters, where even if a less-lethal round is less likely than a firearm to kill the subject, a failed deployment can leave officers facing the same lethal threat after they have spent time and distance on an unsuccessful intervention.

### What is missing

The evidence base does not provide a reliable, generalizable figure for:

- first-round incapacitation;
- overall encounter-resolution success;
- average number of rounds required;
- probability of preventing firearm use;
- probability of preventing officer injury;
- comparative effectiveness against CEWs, OC, or 40 mm sponge rounds; or
- effectiveness specifically against actively attacking edged-weapon subjects.

The absence of these figures should be treated as an important research gap rather than filled with manufacturer, training, or anecdotal claims.

## Injury and Safety Evidence

### Foundational clinical evidence

de Brito and colleagues (De Brito et al., 2001) published one of the foundational clinical studies of police beanbag injuries. They examined 40 patients struck by police beanbag rounds, representing 99 rounds fired. Reported injuries included:

- thoracic penetration;
- ocular injury;
- abdominal injury;
- splenic rupture;

- pneumothorax;
- cardiac contusion;
- fractures; and
- soft-tissue trauma.

One patient died following penetrating thoracic trauma. This study is especially important because it demonstrates that a munition designed for blunt impact can penetrate the body and produce lethal injury.

### Modern penetrating-injury evidence

Olson and colleagues (Olson et al., 2020) reported a series of patients injured by beanbag munitions during 2020 protests in Austin, Texas. The case series included serious injuries requiring hospital admission, operative intervention, treatment for intracranial injury, and management of penetrating trauma. The paper reinforced a central conclusion from the older literature: "less lethal" describes intended risk reduction relative to firearms, but does not mean that penetration, permanent disability, or life-threatening injury cannot occur.

### Deep tissue and pelvic injury

Schenck and colleagues (Schenck et al., 2021) described a penetrating deep pelvic injury caused by a less-lethal beanbag munition. Although a case report cannot estimate incidence, it is highly relevant mechanistically because it shows that flexible kinetic projectiles can penetrate deeply enough to threaten major structures even when designed primarily for blunt trauma. Thakur and colleagues (Thakur et al., 2013) similarly documented penetrating chest injury from a beanbag projectile. These cases demonstrate that projectile deformation is not guaranteed, particularly when range, impact angle, clothing, target anatomy, or munition behaviour differ from ideal conditions.

### Experimental biomechanical evidence

Chan and Yeung (Chan & Yeung, 2003) examined police beanbag injuries in a pork model. Their findings demonstrate that injury severity depends on impact energy, firing distance, projectile deformation, depth of tissue overlying vulnerable structures, and anatomical target. The study is useful because it helps explain why the same munition can produce a superficial contusion in one circumstance and serious internal injury in another.

### Mixed less-lethal injury series

Suyama and colleagues (Suyama et al., 2003) examined injury patterns associated with less-lethal weapons during civil unrest. The series included both 12-gauge beanbag rounds and larger-calibre impact projectiles. Approximately 28% of patients in the clinical series experienced significant morbidity. Because multiple munition types were combined and the sample consisted of people who sought medical treatment, this figure must not be interpreted as the probability of significant injury from any individual police deployment; its

value lies in documenting the types and severity of injury that can occur when kinetic impact projectiles strike vulnerable areas.

### Broader kinetic-projectile evidence

Haar and colleagues (Haar et al., 2017) conducted a systematic review of kinetic impact projectiles used in crowd-control settings. Across 26 studies involving 1,984 people, they identified 53 deaths and 300 cases of permanent disability. Although the review included multiple projectile types and cannot be treated as a shotgun-specific injury rate, it provides strong evidence that kinetic impact weapons can cause death and permanent disability, particularly when projectiles strike the head, neck, chest, or other vulnerable anatomical regions. The findings are directly relevant to less-lethal shotgun policy because the injury mechanism is the same fundamental one – high-energy blunt projectile impact.

## Anatomical Location Matters

Target location is one of the most important determinants of injury severity. The intended target zones for kinetic impact weapons generally emphasize large muscle groups and avoidance of vulnerable anatomy. Higher-risk regions include:

- head;
- eye;
- face;
- neck;
- throat;
- chest;
- precordium;
- spine;
- abdomen;
- groin; and
- other areas where bone or vital organs lie close to the surface.

de Brito et al. (De Brito et al., 2001), Olson et al. (Olson et al., 2020), and the broader kinetic-projectile review by Haar et al. (Haar et al., 2017) all demonstrate that impacts to vulnerable areas can result in major trauma. The same weapon can therefore function as intermediate force when directed toward a lower-risk target zone and as potentially deadly force when directed toward the head, neck, chest, or other vulnerable anatomy, which means that targeting policy forms part of the weapon's safety system.

## Distance Matters

Less-lethal shotgun munitions are engineered to behave within specified operating distances. At very short range, a projectile may strike before fully deploying or flattening, deliver greater energy over a smaller surface area, behave more like a penetrating projectile, or produce disproportionately severe injury. At excessive distance, the projectile may lose energy, become less accurate, fail to produce the intended behavioural effect, or increase the chance of striking an unintended body area. This creates an operational tension: the weapon may be more dangerous at very close distance and less reliable at excessive distance, and officers may have limited ability to maintain the ideal deployment distance once a subject begins advancing in an edged-weapon encounter.

## Accuracy and Unintended Targeting

Kinetic-impact munitions require accurate placement. Aiming for a large muscle group does not guarantee impact there. Potential contributors to unintended strikes include:

- subject movement;
- officer movement;
- stress;
- low light;
- partial obstruction;
- irregular projectile flight;
- ricochet;
- range-estimation error; and
- changes in body position between trigger press and impact.

This matters because the difference between a thigh impact and an eye, throat, or chest impact can be the difference between temporary pain and catastrophic injury.

## Penetration Risk

Although a less-lethal shotgun round is not intended to penetrate, penetration is well documented. Penetrating injuries have involved:

- thorax;
- abdomen;
- pelvis; and
- other soft tissues.

Penetration risk is particularly concerning where:

- firing distance is short;
- the projectile fails to deploy as designed;
- the impact occurs over a bony or anatomically vulnerable region; or
- projectile energy is concentrated over a small surface area.

The term less lethal therefore describes a design intention and comparative risk profile, not a physical guarantee.

## When Its Use May Be Appropriate

The scientific literature does not establish a universal deployment threshold, but the risk-benefit profile supports several broad propositions. A less-lethal shotgun is most defensible where:

- a person presents a significant physical threat;
- officers require a force option that can be delivered from greater distance than a baton or handheld spray;
- hands-on control would expose officers to substantial risk;
- the subject is not presenting an immediate threat that requires reliable lethal-force stopping capability;
- officers have sufficient distance, cover, and reaction time to tolerate potential failure; and
- a lower-risk intervention is unlikely to achieve control.

Potentially appropriate circumstances can include:

- a dangerous but contained person refusing to relinquish a weapon;
- violent resistance where officers can maintain distance;
- circumstances where officers seek to interrupt threatening behaviour without immediately using lethal force;
- a suicidal or emotionally disturbed person whose actions create an imminent risk but who can be engaged from cover; or
- situations where kinetic impact may permit officers to close distance safely after successful deployment.

The weapon is most defensible as part of a planned tactical structure, not as an automatic substitute for a firearm.

## When Its Use May Be Inappropriate

### Low-level or passive resistance

Given the documented potential for fracture, penetration, internal injury, permanent disability, and death, less-lethal shotgun deployment is difficult to justify against a person presenting little or no immediate safety threat – a comparatively serious injury mechanism that places the weapon well above trivial or minimal force.

### Vulnerable anatomical target

Intentional shots toward the head, face, neck, chest, or other highly vulnerable regions can create a substantial risk of serious bodily injury or death. Where officers intentionally target such areas, the force may need to be analyzed as potentially deadly force, depending on the circumstances and applicable law.

### Immediate lethal assault without adequate tactical margin

A beanbag or sock round should not be assumed to provide firearm-equivalent stopping reliability. Where a person is actively charging with an edged weapon, shooting, or otherwise capable of causing death within seconds, a failed less-lethal round may leave insufficient time for officers to respond. Relevant considerations include:

- distance;
- cover;
- reaction time;
- subject speed;
- availability of lethal-force backup; and
- whether failure can be safely tolerated.

### Unsafe range

Deployment outside the munition's intended operating range can alter both effectiveness and injury risk: very short-range firing may increase penetration risk, while excessive distance may reduce accuracy and effectiveness.

### Repeated impact after control

Each round should be treated as a separate application of force, and once the subject is no longer threatening, actively resisting, or otherwise requiring the same degree of force, additional rounds become increasingly difficult to justify.

### Inability to control target location

If the circumstances make it unreasonably likely that a projectile intended for the thigh or lower abdomen will strike the head, neck, or chest, the expected injury risk changes materially.

## Relevance to Edged-Weapon Encounters

A less-lethal shotgun can deliver substantial kinetic force from greater distance than a baton or hands-on intervention, creating an opportunity to resolve some edged-weapon incidents without conventional firearm injury. The principal uncertainty is whether the impact will stop the behaviour quickly enough.

### Potential role

A beanbag, sock, or comparable 12-gauge impact munition may:

- interrupt an armed subject's movement;
- produce localized motor dysfunction;
- cause enough pain or physical disruption to prompt surrender;
- create an opportunity for disarming or restraint; or
- provide a lower-lethality attempt in a contained armed-person encounter.

### Conditions favouring deployment

Use is more plausible where:

- officers have cover and meaningful separation;
- the subject is contained or moving predictably;
- an appropriate target area is available;
- the round can be used within its intended operating distance;
- another officer or force option is available if it fails; and
- officers have enough reaction time to reassess before the subject can reach anyone.

### Failure consequences

The existing literature does not provide a reliable first-round incapacitation rate. A subject may:

- absorb the impact and continue advancing;
- be struck in a non-incapacitating location;
- experience pain without losing motor capability; or
- require repeated rounds or escalation.

Because edged-weapon assaults can develop over very short time intervals, a failed impact may leave the officer facing the same lethal threat after consuming valuable time and distance.

### Risk trade-off

For the subject, less-lethal shotgun deployment may avoid penetrating firearm injury, but serious blunt and penetrating injuries – including rare fatal injuries – are documented. For police and third parties, the defining risk is underestimating the consequences of failure. The strongest edged-weapon application is therefore a

dangerous but tactically manageable encounter where officers can attempt lower-lethality force without depending on it for immediate survival. The weakest is an already developing lethal assault where failed incapacitation cannot be safely tolerated.

## U.S. Legal Considerations

### Fourth Amendment framework

Use of a less-lethal shotgun during a seizure is generally evaluated under the objective-reasonableness standard of *Graham v. Connor*. Because beanbag rounds can cause severe injury, courts do not treat them as trivial force, and relevant factors include:

1. severity of the suspected offense;
2. whether the subject poses an immediate threat to officers or others;
3. whether the subject is actively resisting or attempting to flee;
4. the severity of the force used;
5. whether a warning was feasible;
6. whether less intrusive alternatives were reasonably available; and
7. the totality of the circumstances at the moment force was used.

### Deorle v. Rutherford

*Deorle v. Rutherford*, 272 F.3d 1272 (9th Cir. 2001) is the foundational Ninth Circuit case involving a police beanbag round. An officer fired a lead-filled beanbag round into the face of an emotionally disturbed man who was walking toward officers. The impact destroyed one of Deorle's eyes and embedded lead shot in his skull. The Ninth Circuit concluded that the force was excessive under the circumstances, emphasizing that Deorle:

- was unarmed at the moment he was shot;
- had not attacked anyone;
- had generally obeyed police instructions;
- had not committed a serious offense; and
- received no warning that he would be shot if he continued approaching.

The court stated that a desire to resolve a potentially dangerous situation quickly does not, standing alone, justify force capable of causing serious injury. Deorle is especially important for qualified-immunity analysis because it clearly established that substantial less-lethal projectile force cannot be used gratuitously against a non-threatening or compliant person.

### Warning

Deorle also established the importance of warning where feasible. The court gave significant weight to the officer's failure to warn that a beanbag round would be fired if Deorle continued to approach. A warning is not mechanically required in every rapidly evolving situation, but when officers have time to provide one before using substantial force, failure to do so can weigh strongly against reasonableness.

### Glenn v. Washington County

In *Glenn v. Washington County*, 673 F.3d 864 (9th Cir. 2011) (*Glenn v. Washington Cnty.*, 2011), officers confronted a suicidal teenager holding a small knife to his own neck. Officers fired beanbag rounds and later lethal rounds. The Ninth Circuit emphasized that the subject had not threatened officers or others before beanbag deployment; that the most important Graham factor is whether the person presents an immediate threat; that police must consider reasonable less intrusive alternatives where circumstances allow; and that escalation created by police tactics can be relevant to the totality of the circumstances. Glenn is particularly important for this research project because it directly involves an edged-weapon crisis and demonstrates that possession of a knife does not automatically resolve the constitutional question – the analysis still turns on what the person is doing with the weapon and the immediacy of the threat.

### Qualified immunity

Less-lethal shotgun qualified-immunity analysis remains highly fact-specific, but the core clearly established principles include:

- significant kinetic force requires a substantial governmental justification;
- force becomes harder to justify once an immediate threat ends;
- warning matters when feasible;
- striking vulnerable anatomy materially increases force severity; and
- a weapon's "less-lethal" label does not reduce the constitutional significance of the injury it is capable of producing.

Conversely, courts are more likely to find deployment reasonable where a subject:

- is armed;
- presents an immediate threat;
- ignores repeated commands;
- remains capable of inflicting serious injury;
- and officers use the weapon in an effort to avoid lethal force.

## Ethical and Moral Considerations

The ethical justification for a less-lethal shotgun is primarily the substitution of lower expected lethality for firearm force, which is powerful when the realistic alternative is a firearm but considerably weaker when the realistic alternative is patience, containment, communication, or another force option with lower expected injury.

### Harm reduction

The weapon's strongest moral rationale is to create a meaningful chance of resolving a dangerous encounter without killing the person, which is a genuine benefit – but one that depends on two assumptions: that the less-lethal round is reasonably likely to work, and that the attempt does not expose officers or third parties to a greater lethal risk if it fails.

### Serious injury as an intended risk

Unlike chemical spray, a kinetic impact round achieves its purpose by transferring enough mechanical energy to cause intense pain and physical dysfunction; some degree of tissue trauma is therefore inherent in the mechanism. The ethical question is not whether injury is possible but whether the expected injury is proportionate to the harm being prevented.

### Tactical experimentation

There is an ethical difference between using a less-lethal shotgun from cover with lethal-force backup and using it as an unsupported experiment against a rapidly advancing armed person. If failure is foreseeable and catastrophic, selecting the less-lethal option may shift risk from the subject to officers, bystanders, or victims.

### Targeting

Because anatomical target strongly determines injury severity, target selection carries a direct ethical dimension. Aiming at a lower-risk region demonstrates an attempt to reduce harm, while intentionally targeting the head, neck, or chest may undermine the weapon's harm-reduction rationale unless deadly force would otherwise be justified.

### Repeated rounds

Each additional projectile adds cumulative blunt trauma, and repeated firing therefore requires reassessment rather than automatic continuation simply because the first round did not achieve compliance.

### Terminology

The phrase less lethal should never be interpreted as non-lethal. The scientific literature documents:

- death;
- penetrating injury;
- permanent disability;

- internal-organ injury; and
- major surgery.

Public and policy communication should reflect that reality.

## Evidence Limitations

The evidence base has substantial limitations.

First, denominator data are poor: most medical studies examine injured patients without reporting the total number of police deployments from which those injuries arose.

Second, effectiveness is under-studied: there are few rigorous studies measuring successful incapacitation or encounter resolution.

Third, ammunition varies: “beanbag” can refer to different projectile constructions, masses, velocities, shapes, and manufacturers.

Fourth, deployment distance varies: injury risk and projectile behaviour change with range.

Fifth, target location varies: a thigh strike and an eye or thoracic strike cannot reasonably be assigned the same risk.

Sixth, crowd-control evidence is not identical to patrol evidence: some of the strongest kinetic-projectile literature arises from civil unrest and protest settings rather than individual police encounters.

Seventh, clinical case series are affected by selection bias: people with minor or no injuries are less likely to appear in trauma-centre datasets.

Eighth, successful uses may be systematically underreported in the academic literature.

Ninth, product generations change over time: findings from older lead-shot beanbag systems may not perfectly describe every contemporary sock or flexible projectile.

Tenth, the evidence specific to edged-weapon confrontations is particularly limited.

For this evidence library, the medical literature should therefore be used to characterize what harm is possible and which factors increase risk, not to estimate a precise probability of serious injury per deployment.

## Bottom Line

### Effectiveness

Low-to-moderate evidence supports the operational effectiveness of less-lethal shotgun munitions, which can interrupt dangerous behaviour and create an opportunity for restraint, though peer-reviewed literature does not provide a reliable overall success or first-round incapacitation rate.

### Injury

Blunt trauma, fractures, ocular injury, internal-organ injury, and soft-tissue damage are well documented, representing a meaningful injury risk.

### Serious injury/death

Penetrating injury, permanent disability, and death are clearly documented – particularly after vulnerable-area or short-range impacts – though the absolute rate per deployment is not quantifiable from the existing literature.

### Comparative safety

Less-lethal shotguns are likely substantially less lethal than conventional firearm ammunition when used as designed, but they are not demonstrably a low-injury option in the same sense as handheld OC spray.

### Tactical limitation

The weapon should not be assumed to stop an immediately dangerous armed subject reliably. Failure may leave officers facing the same lethal threat after consuming time and distance.

### Risk-benefit assessment

The strongest justification for a less-lethal shotgun is when officers face a dangerous but tactically manageable threat and can attempt a lower-lethality intervention from distance, preferably with cover and lethal-force backup. Its weakest justification is against passive or low-level resistance, at unsafe range, toward vulnerable anatomy, or where failure would create an unacceptable probability of officer or third-party death.

## Core Peer-Reviewed Evidence

1. de Brito, D., Challoner, K. R., Sehgal, A., & Mallon, W. (2001)
The injury pattern of a new law enforcement weapon: The police bean bag.
*Annals of Emergency Medicine, 38*(4), 383–390.
DOI: 10.1067/mem.2001.117272

Priority: Essential / foundational clinical study.

Contribution: Examined 40 patients representing 99 beanbag rounds.

Key finding: Injuries included penetrating thoracic, ocular, and abdominal trauma, splenic rupture, pneumothorax, cardiac contusion, and other major injuries.

Mortality: One patient died following penetrating thoracic trauma.

Key value: Demonstrates that a projectile designed for blunt impact can penetrate and kill.

Limitation: Clinical case series lacks a deployment denominator and therefore cannot estimate injury probability per police use.

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2. Olson, K. A., et al. (2020)

Penetrating Injuries from “Less Lethal” Beanbag Munitions.
*New England Journal of Medicine.*
DOI: 10.1056/NEJMc2025923

Priority: Essential modern injury evidence.

Contribution: Described serious beanbag injuries during 2020 civil unrest in Austin, Texas.

Key finding: Patients required hospital admission and operative care, and injuries included penetrating and intracranial trauma.

Key value: Demonstrates that severe injury remains relevant with contemporary deployments.

Limitation: Case series of injured patients cannot establish incidence across all rounds fired.

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3. Haar, R. J., Iacopino, V., Ranadive, N., Weiser, S. D., & Dandu, M. (2017)

Death, injury and disability from kinetic impact projectiles in crowd-control settings: a systematic review.
*BMJ Open, 7*(12), e018154.
DOI: 10.1136/bmjopen-2017-018154

Priority: Essential broader kinetic-impact systematic review.

Contribution: Reviewed 26 studies involving 1,984 people injured by kinetic impact projectiles.

Key finding: Identified 53 deaths and 300 permanent disabilities.

Risk finding: Severe outcomes were strongly associated with impacts to vulnerable anatomical areas and close-range use.

Relevance: Not specific to 12-gauge beanbag systems, but highly relevant to the shared kinetic injury mechanism.

Limitation: Combines multiple projectile types and deployment contexts.

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4. Suyama, J., Panagos, P. D., Sztajnkrycer, M. D., FitzGerald, D. J., & Barnes, D. (2003)
Injury patterns related to use of less-lethal weapons during a period of civil unrest.
*Journal of Emergency Medicine, 25*(2), 219–227.
DOI: 10.1016/S0736-4679(03)00179-3

Priority: High clinical field evidence.

Contribution: Examined injuries associated with beanbag and other less-lethal kinetic projectiles during civil unrest.

Key finding: Significant morbidity occurred in approximately 28% of the treated clinical series.

Key value: Demonstrates clinically meaningful injury across real-world deployments.

Limitation: Mixed weapon types and treatment-based sampling prevent estimating the probability of injury per deployment.

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5. Chan, J., & Yeung, R. (2003)
A Study on Police Bean Bag Injuries in a Pork Model.
*Hong Kong Journal of Emergency Medicine, 10*(2), 94–98.
DOI: 10.1177/102490790301000210

Priority: High supporting biomechanical evidence.

Contribution: Experimental examination of tissue injury caused by police beanbag rounds.

Key value: Helps explain how firing distance, energy transfer, tissue depth, and impact location affect injury severity.

Limitation: Animal-tissue model cannot directly quantify human injury probability or operational effectiveness.

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6. Schenck, C. S., et al. (2021)
Penetrating deep pelvic injury due to “less-lethal” beanbag munitions: a case report and policy implications.
*Trauma Surgery & Acute Care Open, 6*, e000754.
DOI: 10.1136/tsaco-2021-000754

Priority: Supporting severe-injury evidence.

Contribution: Documents deep pelvic penetration from a beanbag munition.

Key value: Demonstrates that flexible projectiles can penetrate deeply enough to threaten major anatomical structures.

Limitation: Single case; cannot establish frequency.

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7. Thakur, M., et al. (2013)
Non-lethal? Penetrating chest injury due to beanbag bullet.
*BMJ Case Reports.*
DOI: 10.1136/bcr-2012-008482

Priority: Supporting injury-mechanism evidence.

Contribution: Documents penetrating thoracic injury caused by a nominally non-lethal beanbag round.

Key value: Reinforces the importance of range, target zone, and projectile behaviour.

Limitation: Case report.

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8. Manhas, A., et al. (2021)
Non-lethal weapon: Injury patterns and imaging correlates for firearm alternatives.
*Clinical Imaging, 75*, 165–172.
DOI: 10.1016/j.clinimag.2021.03.007

Priority: High supporting medical review.

Contribution: Reviews injury patterns and radiologic findings associated with firearm alternatives, including kinetic less-lethal projectiles.

Key value: Useful for identifying clinically important blunt and penetrating trauma across projectile types.

Limitation: Broader than 12-gauge less-lethal shotgun systems alone.

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9. Petersen, K., Koper, C. S., Taylor, B. G., Liu, W., & Sheridan-Johnson, J. (2025)
Less-Lethal Weapons and Civilian Injury in Police Use of Force Encounters: A Multi-agency Analysis.
*Journal of Urban Health, 102*(2), 389–399.
DOI: 10.1007/s11524-024-00940-1

Priority: Important modern comparative field study.

Contribution: Analyzed 2,348 use-of-force incidents from 17 large urban and metropolitan agencies.

Key value: Provides a modern comparative estimate for injury severity across broad force categories.

Limitation: Less-lethal rifle/shotgun ammunition is combined with other modalities in grouped categories, preventing clean isolation of 12-gauge beanbag effects.

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10. Bozeman, W. P., et al. (2018)
Injuries associated with police use of force.
*Journal of Trauma and Acute Care Surgery, 84*(3), 466–472.
DOI: 10.1097/TA.0000000000001783

Priority: Supporting real-world comparative study.

Contribution: Prospective multicentre study with physician assessment of police use-of-force injuries.

Key value: Provides medically assessed outcomes and includes kinetic impact munitions among force modalities.

Limitation: Small numbers for individual projectile categories limit shotgun-specific inference.

## Evidence Rating

Operational effectiveness: ★★☆☆☆ to ★★★☆☆
Direct success-rate and incapacitation evidence is limited.

General injury evidence: ★★★★☆
Multiple clinical series, case reports, and broader kinetic-projectile studies document predictable injury mechanisms.

Serious-injury probability: ★★★☆☆
Severe injury is clearly possible, but poor denominator data prevent reliable probability estimates.

Mortality evidence: ★★★☆☆
Deaths are documented, but the absolute mortality rate per deployment is unknown.

Comparative evidence: ★★☆☆☆ to ★★★☆☆
Some modern comparative work exists, but 12-gauge less-lethal shotgun effects are often aggregated with other kinetic options.

Anatomical/range evidence: ★★★★☆
Evidence strongly supports the importance of target location, projectile behaviour, and firing distance.

Overall confidence: Moderate for injury mechanisms; low-to-moderate for operational effectiveness.

### Research-library conclusion

Less-lethal shotguns occupy an important but scientifically difficult position in police force options. Their intended purpose is to give officers a way to deliver incapacitating blunt force from distance while reducing the probability of death relative to conventional firearm ammunition. The medical literature clearly demonstrates that this reduction in lethality is incomplete: beanbag and similar rounds can penetrate, fracture bone, damage internal organs, cause permanent disability, and kill, particularly when fired at vulnerable anatomy or under conditions that concentrate impact energy. At the same time, the peer-reviewed literature provides surprisingly little denominator-based evidence on how often these weapons successfully resolve encounters or how frequently serious injury occurs across all deployments. Their strongest justification is therefore not that they are "safe," but that they may offer a lower-lethality alternative in dangerous, tactically controlled situations where officers have enough distance, cover, and backup to tolerate failure. Their weakest justification is against low-level resistance, at unsafe range, toward vulnerable anatomy, or in rapidly developing lethal-threat encounters where failure would leave no time to respond.

## References

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*Glenn v. Washington Cnty., 673 F.3d 864 (9th Cir. 2011)* (2011). 673 F.3d 864, United States Court of Appeals, Ninth Circuit. https://casetext.com/case/glenn-v-washington-cnty

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HOW TO CITE

Edged-Weapon Response Lab. (2026). *Less-Lethal Shotgun*. In *EWRL Evidence Library* (Version 1.0). https://droptheknife.org/evidence-base/I_LessLethalShotgun (https://droptheknife.org/evidence-base/I_LessLethalShotgun)