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Performance of the Winchester 9mm 147 Grain Subsonic Jacketed Hollow Point Bullet in Human Tissue and Tissue Simulant

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Twenty-seven shootings were reviewed. The penetration depth of the 147 grain Winchester Subsonic JHP bullet in living human tissue was measured at autopsy, and the bullet's expansion was measured from the recovered bullets. These were compared to the bullet's performance in 10% ordnance gelatin shot at 4 degrees Centigrade. A close correlation was found.

In 1987 the San Diego Police Department adopted the 9mm Parabellum 147 grain Subsonic jacketed hollow point (JHP) Winchester bullet for its duty pistols. The adoption was based on the recognition that adequate penetration potential is of paramount importance to bullet performance. Shots with this bullet into 10% ordnance gelatin shot at 4 degrees C confirmed that it reliably and consistently penetrated over 12 inches.

Recognizing that the human torso contains different organs of varying densities, while gelatin tissue simulant is a homogeneous material, it was decided to collect results from shootings with the newly adopted 147 grain 9mm bullet and compare them with results from the shots into the 10% gelatin. Bullet penetration depths were measured at autopsies resulting from officer involved shootings. Ordinarily, measured penetration depth figures are **not** found on autopsy reports. However, for this study our medical examiner agreed to measure bullet penetration depths and include them in the autopsy reports. Only shots into the torso that remained in the body for their entire penetration depth were included in this study. Measurements of bullet expanded diameter and its remaining length were taken directly from the bullets recovered at autopsy. These results were then compared with results from the 10% ordnance gelatin in order to assess the accuracy of this tissue simulant's predictive accuracy.

SHOTS INTO ORDNANCE GELATIN

The gelatin was prepared using the method of the Letterman Army Institute of Research (1). After each shot, the bullet's penetration depth in the gelatin, its expanded diameter (average of the largest and smallest diameter - most expanded bullets are not exactly round), and its length were measured. An expansion ratio was derived for each bullet by dividing its expanded diameter (ED) by its remaining length (RL).

The 147 grain Winchester Subsonic JHP bullet had an average penetration depth in the 10% gelatin of approximately 13 inches with a range of 12 to 14 inches. The bullet's expansion ratio approximated 1.20. It's average velocity (measured with an Ohler Model 33 chronograph) was 950 feet per second. These results were obtained from 20 shots, from two different lots of ammunition.

SHOTS FROM HUMAN AUTOPSIES

The following chart lists information retrieved from the autopsy reports and crime laboratory investigations and observations. It should be noted that all head wounds, and bone hits were eliminated; this study deals only with shots that penetrated soft tissue of the torso and did not hit bone.

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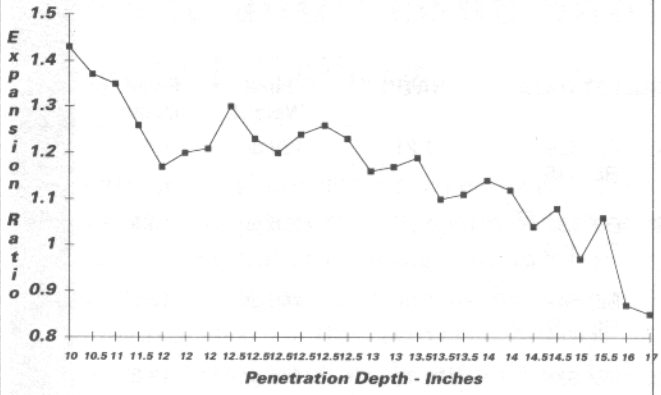
Measurements From Human Shootings with Winchester Subsonic 147 Grain JHP Bullet

	BULLET DATA	RATIO	Final Weight	Penet. Depth
1.	ED .535 RL .470	1.14	142 gr.	14"
2.	ED .565 RL .435	1.30	137 gr.	12.5"
3.	ED .584 RL .410	1.43	140 gr.	10"
4.	ED .538 RL .460	1.17	143 gr.	12"
5.	ED .538 RL .437	1.23	141 gr.	12.5"
6.	ED .480 RL .552	0.87	145 gr.	16"
7.	ED .550 RL .515	1.06	139 gr.	15.5"
8.	ED .572 RL .454	1.26	132 gr.	11.5"
9.	ED .545 RL .562	0.97	145 gr.	15"
10.	ED .562 RL .468	1.20	138 gr.	12"
11.	ED .542 RL .467	1.16	135 gr.	13"
12.	ED .532 RL .475	1.12	132 gr.	14"
13.	ED .540 RL .450	1.20	137 gr.	12.5"
14.	ED .536 RL .458	1.17	134 gr.	13"
15.	ED .539 RL .453	1.19	144 gr.	13.5"
16.	ED .581 RL .430	1.35	141 gr.	11"
17.	ED .539 RL .445	1.21	139 gr.	12"
18.	ED .582 RL .425	1.37	135 gr.	10.5"
19.	ED .542 RL .437	1.24	140 gr.	12.5"
20.	ED .531 RL .483	1.10	141 gr.	13.5"
21.	ED .537 RL .516	1.04	138 gr.	14.5"
22.	ED .533 RL .494	1.08	135 gr.	14.5"
23.	ED .462 RL .544	0.85	146 gr.	17"
24.	ED .535 RL .425	1.26	143 gr.	12.5"
25.	ED .530 RL .431	1.23	138 gr.	12.5"
26.	ED .537 RL .484	1.11	134 gr.	13.5"
27.*	ED .531 RL .506	1.05	137 gr.	14.5"
28.*	ED .540 RL .495	1.09	144 gr.	13.5"

NOTES

- *Shots marked with an asterisk (*) had stopped just under the skin.*
- *ED = Expanded Diameter*
- *RL = Recovered Length*
- *Shot number 22 passed through an arm before penetrating the torso; the length of the path in the arm was added to the path in the torso to arrive at the final 14.5 inch penetration depth.*

These penetration depths were plotted against the expansion ratios; the results are shown below.



Measurements from shootings demonstrate that as bullet expansion increases, penetration decreases

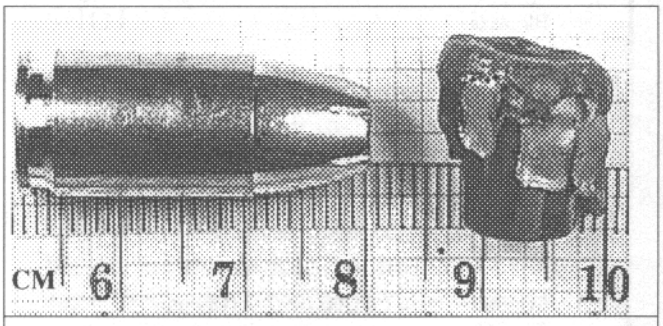
DISCUSSION

Shots into gelatin show a narrower range of penetration depths than that observed in the living human torso; while the penetration range in gel was 12 to 14 inches, the same bullet, in the torso, had a range from 10 to 17 inches.

The expansion ratios of the 147 grain 9mm bullet in 10% ordnance gelatin was about 1.20, with an average penetration depth of 13 inches. In living human torsos, the average penetration depth was also found to be 13 inches, with an expansion ratio of 1.15. The greater spread in the torso shots is not surprising considering the variety of tissues encountered, compared to the homogeneous gelatin. The two bullets found just beneath the skin (# 27 and 28) would most likely have penetrated more deeply if they had not been stopped by the "holding in" effect of the skin (2).

The data presented shows a clear relationship of expansion ratio to bullet penetration depth; the higher the ratio, the less the penetration depth. The penetration of a handgun bullet in tissue or tissue simulant is analogous to the penetration of a long range center-fire rifle bullet in air; tissue is about 800 times as dense as air, but the same physical laws apply. The 1000 yard target shooter, the military or law enforcement sniper, and the long range "varmint" shooter know the critical importance of bullet sectional density (heavier bullets in the same caliber retain velocity better -- or, one might say, penetrate air more efficiently), along with bullet shape, in determining its long range performance.

Handgun penetration potential was rarely considered prior to 1986, except perhaps by those who used the larger handguns for big game hunting. When the FBI lost two agents, in the "Miami



Winchester 9 mm 147 grain JHP subsonic bullet. The expanded bullet was recovered from gelatin and is typical of the deformation seen in muscle tissue.

shootout," due to inadequate bullet penetration, they convened a workshop (Sept. 1987) and determined that they (along with many others) had been misled by the National Institute of Justice's now infamous Relative Incapacitation Index (which rated bullet performance by temporary cavitation -- ignoring penetration depth).

Post-expansion sectional density of a handgun bullet predicts how deeply it will penetrate in tissue or tissue simulant. All other things being equal, heavier bullets in a given caliber can be expected to penetrate more deeply. The penetration capacity of a bullet is modified by the frontal resistance of the expanded bullet. The greater the expansion, the less the penetration. Overexpansion can decrease penetration potential to the point that deeply placed vital structures are unlikely to be disrupted, even with a perfectly placed shot (especially if it must pass through an arm on the way to the torso -- not uncommon: it occurred in shot

22 of this series). Underexpansion can result in too small a bullet path and an increased probability of overpenetration.

Everyone worries about overpenetration because of the danger posed to others beyond the bullet's intended target. In purely practical terms, overpenetration should also be viewed as a waste of the limited potential available to the handgun user. That wasted potential should ideally be put into making a larger hole.

Between 12 and 20 inches of penetration should assure that the bullet reaches vital organs and vessels from any angle, even in heavily built persons, *with enough potential remaining to disrupt them.*

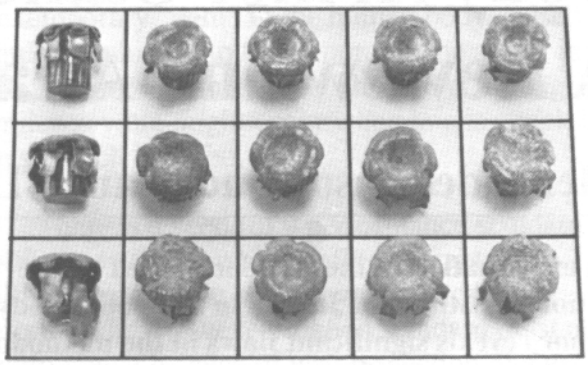
Shots fired into correctly prepared gelatin tissue simulant can be a valuable guideline in the selection of police ammunition. It is most useful in separating out the grossly inadequate bullets; those that penetrate only 6 or 7 inches, or SP/HP bullets that do not expand adequately.

CONCLUSION

Based on comparisons of data from living tissue penetrations by the 147 grain Subsonic Winchester, 9mm Parabellum bullet with test shots of the same bullet into 10% Knox Ordnance Gelatin, type 250A, shot at 4 degrees centigrade, it is concluded that this gelatin can be a useful predictor of this bullet's penetration and expansion characteristics in shots in the human torso.

REFERENCES

1. Fackler ML, Malinowski JA. *Ordnance gelatin for ballistic studies: Detrimental effect of excess heat used in gelatin preparation.* **American Journal of Forensic Medicine and Pathology** 9(3): 218-219, 1988.260. 2. 2. Fackler ML. Handgun bullet performance. Int Def Rev 21(5):555-557, 1988.



Display of Winchester 147 Gr.. JHP rounds fired into : Pig abdomen (top row); pig muscle (middle row); and water (bottom row). Note that the abdomen shots caused the least expansion; the shots into muscle caused slightly greater expansion and the water shots caused the most expansion.

EDITOR'S COMMENT

What Gene Wolberg has done here is what every clear thinking law enforcement agency should be doing. Skepticism and meaningful comparison are the essence of common sense and all scientific thought. Let's all exercise some healthy *skepticism* -- don't believe that your tissue simulant is a good predictor just because some Army Lab or the FBI uses it and says so – check it out for yourself.

It was encouraging to see the penetration depth measurements taken by the medical examiner for this series. Now that bullet performance is being measured, by many, in a reproducible manner in gelatin, the forensic and crime solving potential of this technique can be greatly enhanced if medical examiners can be persuaded to include measured bullet penetration depths in their autopsy reports (a scale drawing showing the tissue disruption pattern along the bullet's path would be nice, too – but that will be the subject of future article).

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