

SURVEY OF RECENT HALAKHIC PERIODICAL LITERATURE: CADAVERIC DENTAL IMPLANTS

I. THE NATURE OF THE PROBLEM

In recent decades, tooth implants have largely supplanted dentures in replacing natural teeth that have been lost. Implants are essentially false teeth permanently anchored in the jawbone. In some patients, loss of natural teeth is the result of, or accompanied by, bone degeneration that effectively prevents prosthetic implantation. That problem can be ameliorated by augmenting existing bone with implanted material.

Bone grafts are used both as a filler and as a scaffold to facilitate bone formation. Bone grafts also act as a mineral reservoir that serves to induce osseogenesis, i.e., new bone formation. Such grafts are bioabsorbable and produce no antigen-antibody reaction. As natural bone grows it gradually replaces the graft material completely and results in a fully integrated region of new bone. It is possible to use natural bone tissue obtained in the form of an autograft, a bovine-derived xenograft or bone tissue derived from cadavers, or to use artificial, synthetic or natural substitutes, particularly titanium or ceramic-based materials, for this purpose. Which is to be preferred is a matter that varies according to physiological circumstances and the clinical judgment of the practitioner. Bone tissue used in dental implants is sterilized, chemically treated to remove factors and proteins, pulverized and mixed with other materials. The congealed compound is then used to reconstruct the jaw artificially. The material is placed within the jaw and is generally covered by the gum during the process of osseointegration.¹ The implant binds with the natural bone, enabling the jaw to support an implant. When that process is completed the gum is

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¹ During the process of osseointegration blood cells migrate into the tissue surrounding the implant. The blood cells interact with the implant and form a fibrine matrix that acts as a scaffold for the migration of osseogenetic cells and results in formation of osteoid tissue and new bone. See A.F. Mavrogenis *et al.*, "Biology of Implant Osseointegration," *Journal of Musculoskeletal Neuronal Interaction*, vol. 9, no. 2 (June, 2009), p. 62.

reopened, an abutment is attached to the implant and the artificial tooth is attached.²

Over the years, as employment of this procedure has become more widespread, an increasing number of dentists and their patients have queried whether performing cadaveric bone implants is consistent with Halakhah. The issues are threefold in nature: 1) abrogation of the obligation of burial; 2) possible *issur hana'ah*, i.e., violation of the prohibition against deriving benefit from a cadaver; and 3) questions of defilement in cases in which the patient or the dentist is a *kohen*. Although to the best of this writer's knowledge, rabbinic respondents, himself included, have been univocal in sanctioning the procedure, no comprehensive treatment of the issue has appeared in print until recently. The first issue of a new journal, *Yadrim* (Nisan 5777), published by the *Beis Medrash* of the Boca Raton Synagogue, features an article devoted to this topic, authored by Rabbi David Shabtai, M.D., rabbi of the Sephardic Minyan of Boca Raton Synagogue. The material was originally published by Rabbi Shabtai as a monograph titled *Kol Azmotai Tomarnah ha-Shem Mi Kamokha*. The matter is also addressed by R. Asher Weiss in his recently published *Teshuvot Minhat Asher*, II, nos. 71 and 72.

Implantation of cadaveric material in the jawbone of the patient results in the ongoing defeat of the obligation to bury the deceased.³ However, assuming that the obligation of burial attaches only to a minimum quantity of cadaveric tissue equal in quantity to a *ke-zayit*,⁴ the patient has no such obligation with regard to the small amount of bone implanted in

² See Mayo Clinic, "Dental Implant Surgery: What You Can Expect," <http://www.mayoclinic.org/tests-procedures/dental-implant-surgery/details/what-you-can-expect/rec-20245754>.

³ Cf., R. Ezekiel Landau, *Teshuvot Noda bi-Yehudah, Mahadura Kamma, Yoreh De'ah*, no. 90. On the other hand, *Mishneh la-Melekh, Hilkhot Avel* 14:21, s.v. *asher*; *Tiferet Yisra'el, Shabbat, Bo'az* 10:1; and R. Menasheh Pollack, *Teshuvot Helek Levi, Yoreh De'ah*, no. 125, assert that the obligation of burial is limited to burial of the head and the major portion of a corpse. Cf., R. Ovadiah Yosef, *Teshuvot Yabi'a Omer*, III, *Yoreh De'ah*, no. 22, sec. 19.

Since there is no statutory obligation with regard to burial of a non-Jewish corpse, the issue is limited to bone tissue derived from the body of a Jew. Cf., however, R. Moshe Sofer, *Teshuvot Hatam Sofer, Orah Hayyim*, no. 208, and *Teshuvot Yabi'a Omer*, III, *Yoreh De'ah*, no. 22, sec. 20. The obligation to bury non-Jewish dead in order to promote harmonious relations between Jews and gentiles does not apply when burial is not desired. See also *infra*, note 5 and accompanying text.

⁴ According to R. Chaim Noe, a *ke-zayit* is equal to approximately 23 grams; according to *Hazon Ish* it is equivalent to approximately 30 grams. See R. Ya'akov Kanievski, *Shi'urin shel Torah* (Bnei Brak, 5729), pp. 65–66. Rabbi Kanievski, *ibid.*, p. 71, suggests that according to some authorities, a *ke-zayit* may be as little as 10 grams.

his mouth.⁵ Nevertheless, an obligation of burial would be incumbent upon the manufacturer of the compound or upon the dentist who has custody of a quantity of bone equal to a *ke-zayit* derived from a single cadaver.

Elsewhere, this author has discussed the permissibility of benefiting from cadaveric tissue in conjunction with the study of anatomy.⁶ As recorded in *Shulhan Arukh, Yoreh De'ah* 349:1, a Jew may not derive benefit from either a Jewish or non-Jewish cadaver. Although all authorities recognize the *issur hana'ah* with regard to the corpse of a deceased Jew, whether that prohibition is biblical or rabbinic in nature is the subject of significant controversy among both medieval and latter-day authorities.⁷ In disagreement with the ruling of *Shulhan Arukh*, some authorities maintain that there are no restrictions with regard to benefiting from a non-Jewish cadaver.⁸ R. Moshe Feinstein, *Iggerot Moshel, Yoreh De'ah*, I, no. 230, *anaf*6, and R. Shlomoh Zalman Auerbach, as cited by Dr. Abraham S. Abraham, *Nishmat Avraham, Yoreh De'ah* (Jerusalem, 5745) 349:1, note 1, permit such benefit in cases of "great need."⁹ Since the majority of this country's population is non-Jewish it may be assumed that the majority of bone donors are non-Jews. Application of the principle "*kol de-parish me-rubba parish*," i.e., given the existence of both a major set and a minor set, any separated entity is to be deemed to have separated itself from the larger set, yields the conclusion that, for halakhic purposes, the cadaveric material used in bone grafts must be deemed to have been derived from the body of a non-Jew. Application of the principle of *kol de-parish me-rubba parish* also effectively resolves the problem of burial of cadaveric material.¹⁰

⁵ Cf., however, R. Joseph Babad, *Minbat Hinnukh*, no. 537, who states that "perhaps there is an obligation of burial with regard to even smaller quantity." A similar doubt was expressed by *Tosefet Yom Tov, Shabbat* 10:4.

⁶ See J. David Bleich, *Contemporary Halakhic Problems*, II (New York, 1983), 60–64.

⁷ See *Pithei Teshuvah, Yoreh De'ah* 349:1 and *Contemporary Halakhic Problems*, VI (Jersey City, N.J., 2012), 400–402. For a discussion of suspension of rabbinic prohibitions for therapeutic purposes see *Contemporary Halakhic Problems*, I (New York, 1977), 98–99.

⁸ See J. David Bleich, *Be-Netivot ha-Halakhah*, III (New York, 5761), 203–210 and *Contemporary Halakhic Problems*, IV (New York, 1995), 185–187.

⁹ See also R. Abraham I. Kook, *Da'at Kohan*, no. 199; R. Ovadiah Hedaya, *Teshuvot Yaskil Avdi*, VI, *Yoreh De'ah*, no. 19; R. Ben-Zion Abba Sha'ul, published in *Teshuvot Yabi'a Omer*, III, *Yoreh De'ah*, no. 20; and R. Ovadiah Yosef, *ibid.*, nos. 21–23.

¹⁰ See *supra*, note 3.

II. TRANSGRESSION TO PRESERVE LIMBS AND ORGANS

As recorded by Rema, *Yoreh De'ah* 157:1, although a person need not accept death in order to avoid transgression of a negative commandment, he is nevertheless obligated to expend even his entire fortune in order to avoid transgression of a prohibition of such severity. *Shakh*, *Yoreh De'ah* 157:3, expresses doubt with regard to whether even sacrifice of a limb or organ is required under such circumstances but inclines toward leniency.¹¹ *Pri Megadim*, *Orah Hayyim*, *Mishbezot Zahav* 328:7, notes that *Shakh* is seemingly contradicted by *Shulhan Arukh*, *Orah Hayyim*, 328:17, who forbids infraction of Sabbath proscriptions prohibited by a negative commandment even if necessary to preserve a limb or an organ. *Pri Megadim* resolves the contradiction by adopting *Shakh's* permissive view with regard to violation of negative commandments other than those involving the even more severe Sabbath violation.¹²

R. Ovadiah Yosef, *Teshuvot Yabi'a Omer*, III, *Yoreh De'ah*, sec. 30, assumes as a matter of course that, if deriving benefit from a corpse is a biblical offense, its status is that of transgressing a negative prohibition carrying the statutory punishment of forty lashes. Nevertheless, Rabbi Shabtai correctly reasons that *Shakh's* ruling constitutes grounds to permit bone transplants even in instances in which it is known that the donor was a Jew.¹³

To this writer, it seems that there are grounds for sanctioning cadaveric implants, even if *Shakh's* position were not fully accepted. The reason for that assertion is that it is not clear that deriving benefit from a corpse

¹¹ Presumably, the rationale underlying *Shakh's* ruling is that a person is required to expend even his entire fortune to avoid transgressing a negative commandment but is not required to accept a sacrifice of greater magnitude. Sacrifice of a limb is an onus greater than expenditure of an entire fortune and hence is not required. For a fuller discussion see J. David Bleich, *Bioethical Dilemmas*, I (Hoboken, N.J., 1998), 241–243. See also *infra*, note 15 and accompanying text.

¹² *Shakh's* permissive view is adopted by *Be'er Heitev*, *Yoreh De'ah* 157:2; *Bet Lehem Yehudah*, *Yoreh De'ah* 157:3; *Darkei Teshuvah*, *Yoreh De'ah* 157:19; R. Joshua Weingarten, *Teshuvot Helkat Yo'av*, *Kava de-Keshita*, no. 103; R. Ovadiah Yosef, *Teshuvot Yabi'a Omer*, III, *Yoreh De'ah*, no. 23, sec. 30; and Dr. Abraham S. Abraham, *Nishmat Avraham*, *Yoreh De'ah* (Jerusalem, 5744) 157:1, note 3. However, *Shakh's* position is ostensibly contradicted by one significant authority, R. Shlomoh Luria, *Teshuvot Maharshah*, no. 3, who regards all negative commandments as comparable to Sabbath prohibitions that may not be transgressed for purposes of preserving a limb. See also *idem*, *Yam shel Shlomoh*, *Hullin* 8:13. Curiously, *Shakh*, *Yoreh De'ah* 179:1, cites *Teshuvot Maharshah* without any indication of his own opposing view. See, however, *infra*, note 25 and accompanying text.

¹³ See *Kol Azmotai Tomarnah ha-Shem Mi Kamokha*, pp. 5–6.

risers to the level of a negative prohibition carrying the penalty of forty lashes. Rambam, *Hilkhot Avodah Zarah* 7:2, appropriately records the prescribed punishment of lashes with regard to biblically prohibited forms of benefit in conjunction with objects devoted to pagan worship. However, in *Hilkhot Ma'akhalot Assurot* 9:1, Rambam states that consumption of meat and milk that have been comingled in cooking is punishable by lashes but fails to record that the same punishment is imposed for deriving benefit from such a mixture. *Lehem Mishneh, ad locum*, explains that omission with the observation that the prohibition against benefitting from such food is not explicitly stated in Scripture.¹⁴ Similarly, Rambam fails to mention a punishment of that nature in either chapter 14 of *Hilkhot Avel* with regard to benefitting from a corpse or in chapter 10 of *Hilkhot Rozeah* with regard to the prohibition against deriving benefit from an *eglah arufah*, i.e., a heifer whose neck is broken in expiation of the murder of an unidentified wayfarer as described in Deuteronomy 21:1–9. The Gemara, *Avodah Zarah* 29b, does not derive the *issur hana'ah* associated with a cadaver from an explicit scriptural passage but by applying a hermeneutic principle effecting transposition of such a stricture from the regulation governing the *eglah arufah*. No benefit may be derived from the corpse of that animal since Scripture compares the *eglah arufah* to sacrificial animals. The Palestinian Talmud, *Avodah Zarah* 5:12, reverses the derivation and deduces the prohibition against deriving benefit from the *eglah arufah* from the prohibition attendant upon deriving benefit from a corpse. The prohibition against benefitting from a corpse is based upon a metaphorical comparison in Psalms 106:28 of human corpses to pagan sacrifices on the basis of which it is established that no benefit may be derived from a cadaver.

There is no citation in either source of an explicit negative commandment with regard to deriving benefit from either an *eglah arufah* or a corpse. The biblical locus of the ban against benefitting from a corpse is the report of the interment of Miriam described in Numbers 20:1. Rabbinic exegesis understands the verse as implying that naught else might be done with her body. The nomenclature employed by Scripture is not that of a negative commandment. Assuming, as does the Palestinian Talmud, that the ultimate source of the prohibition against deriving benefit from a corpse is the rule applicable to the *eglah arufah* which is then

¹⁴ Actually, presumably for the same reason, Rambam, *Hilkhot Ma'akhalot Assurot* 8:16, rules that, for all prohibited foodstuffs from which even benefit may not be derived, lashes are administered only for consuming the food product but not for deriving benefit therefrom.

transposed to deriving benefit from a corpse, the prohibition against deriving benefit from an *eglah arufah* is itself inferred from the role and nature of the *eglah arufah*. As posited by the Gemara, *Avodah Zarah* 29b, the *eglah arufah* serves to expiate transgression in a manner similar to that of a sacrificial animal. Accordingly, a person deriving benefit from an *eglah arufah* is not subject to lashes because the prohibition against deriving such benefit is not explicit in Scripture. Hence, punishment in the form of lashes cannot be transposed to a violation of the ban against benefitting from a cadaver.

Thus, deriving benefit from a cadaver, even if it constitutes a biblical transgression, would seem not to be in the nature of a transgression of an explicit negative commandment but a prohibition established on exegetical grounds. If so, it is arguable that such a prohibition is suspended in order to avoid loss of a limb or an organ. The argument would be that avoidance of such a transgression does not require surrender of one's entire fortune and hence, *a fortiori*, does not require sacrifice of a limb.

It is clear that a person need not expend more than a fifth of his wealth for the sake of fulfilling a positive commandment. It is undoubtedly for that reason that R. Joshua Weingarten, *Teshuvot Helkat Yo'av*, I, *Dinei Ones*, sec. 7, rules that a person need not risk serious illness in order to fulfill a positive commandment. It would certainly seem that loss of a limb or organ is an even greater burden than loss of one's entire fortune, as is evident from *Shakh's* ruling that a person is not required to accept loss of a limb or organ in order to avoid transgressing a negative commandment. Presumably, even if *Shakh's* opinion is not accepted, all would agree that loss of a limb or organ is tantamount to expenditure of more than one-fifth of one's fortune and hence is an onus that a person is not required to assume in fulfilling a positive commandment.¹⁵ *Helkat Yo'av's* ruling seems to be based upon that line of reasoning. It may then well be the case that any disagreement with *Shakh* would be limited to transgressing a severe prohibition in the nature of an explicit negative commandment entailing punishment by lashes but not of a lesser negative prohibition that is not accompanied by that severe punishment.

The concept of loss of a limb is not limited to physical loss but includes loss of function as well.¹⁶ *Nishmat Avraham*, 3rd ed. (Jerusalem, 5774), *Yoreh De'ah* 349:1, note 4, p. 576, correctly states that "danger to

¹⁵ For a fuller discussion see J. David Bleich, *Bioethical Dilemmas*, I (Hoboken, N.J., 1998), 90–93.

¹⁶ See R. Chaim Noe, *Kezot ha-Shulhan*, *Badei ha-Shulhan* 138:18 and *Nishmat Avraham*, *Orah Hayyim* 328:17, note 46.

a limb” includes not only forestalling future loss of functionality, e.g., ability to masticate food, but also restoration of a function that has already been lost. In support of that reasoning, *Nishmat Avraham* cites *Tosafot*, *Bava Mezi'a* 114b, s.v., *amar leih*, who explain that Elijah, who was a *kohen*,¹⁷ was permitted to make tactile contact with a person who had already died in order to restore him to life.

Nishmat Avraham understands *Tosafot* as justifying Elijah’s defilement as an act of *pikuah nefesh*¹⁸ and, accordingly, deduces from *Tosafot*’s comment that restoration of life is to be equated with preventing death from occurring.¹⁹ Similarly, reasons *Nishmat Avraham*, restoring function to an organ²⁰ is to be equated with preventing loss of function.

However, that understanding of *Tosafot*’s comment is probably incorrect. *Tosafot*, in justifying Elijah’s conduct, employ the phrase “for [Elijah] was certain that he would resurrect him.” If Elijah’s justification was rescue of a life, “certainty” would not have been necessary; even

¹⁷ The Gemara, *Bava Mezi'a* 114b, reports that Elijah was addressed as a *kohen* by Rabbah. *Yalkut Shimoni*, *Parashat Pinhas* sec. 771 and *Pirkei de-Rabbi Eli'ezer*, ed. Michael Higger (New York, 5704), chap. 46 identify Elijah as Phineas, the son of Aaron. See also *Pirkei de-Rabbi Eli'ezer* (Warsaw, 5612), chap. 47.

¹⁸ A number of other scholars have also understood *Tosafot* as invoking the principle of *pikuah nefesh*. See R. Jacob Neumark, *Eshel Avraham* (Tel Aviv, 5708), *Perot Ginosar*, no. 23; R. Iser Yehudah Unterman, *Ha-Torah ve-ha-Medinah*, IV, 25f; and *idem*, *Shevet me-Yehudah*, I, *Sba'ar Rishon*, chap. 7.

¹⁹ R. Meir Don Plocki, *Hemdat Yisra'el*, *Maftchet ve-Hosafot*, p. 33, points out that we do not find any source indicating an obligation to resurrect the dead; the obligation to preserve human life extends only to the living. That position is also stated emphatically by R. Moshe Feinstein, *Iggerot Mosheh*, *Yoreh De'ah*, II, no. 174. Rabbi Feinstein suggests that the preservation of life referred to by *Tosafot* is either the life of the child’s grief-stricken mother or perhaps that of Elijah himself.

It has been suggested that there is an obligation to resuscitate or “resurrect” the dead but that this obligation is not encompassed within the general obligation to preserve life. Rather, according to this understanding, the obligation to restore life to one who has already died is based upon the rationale adduced by the Gemara, *Yoma* 85b, “Desecrate one Sabbath on his behalf in order that he may observe many Sabbaths.” The concern, then, is to enhance the total number of *mizvot* performed. Since this is the sole halakhic consideration mandating resuscitation of one already dead, *Tosafot* reason that no halakhic prohibition may be violated in the process unless there is absolute certainty with regard to the success of such efforts. See R. Yechiel Ya'akov Weinberg, *No'am*, IX (5726), p. 124, reprinted in *idem*, *Seridei Esh*, III (Jerusalem, 5726), no. 127, p. 350. Cf., R. Naphtali Zevi Yehudah Berlin, *Ha'amek She'elah*, no. 166, sec. 17, who expresses a similar view in a different context.

²⁰ R. Chaim Noe, *Kezot ha-Hoshen*, *Badei ha-Shulhan* 138:18, states that restoring function even to a partially compromised organ, e.g., correcting a limb, constitutes *sakanat ever*. That position is endorsed by *Nishmat Avraham*, *Orah Hayyim* 328:17, note 36 and *Nishmat Avraham*, 3rd ed. (Jerusalem, 5774), *Yoreh De'ah* 349:1, note 3.

doubtful, or *safek*, *pikuah nefesh* justifies transgression of a biblical prohibition. R. Yechiel Ya'akov Weinberg, *No'am*, IX (5726), p. 214, reprinted in his *Seridei Esh*, III (Jerusalem, 5726), no. 127, p. 35, explains *Tosafot* as invoking, not the principle of *pikuah nefesh*, but the concept of *met mizvah*. The honor of the dead requires that a *kohen* defile himself in the burial of an otherwise unattended corpse, but only if the *kohen*'s ability to provide a suitable burial is a "certainty." Resurrection is the highest form of honor that can be conferred upon the deceased; hence, Elijah, who was capable of restoring the deceased to life, was permitted to defile himself in resurrecting the corpse just as he would have been permitted to bury a *met mizvah*—but only because his ability to carry out the endeavor successfully was known to him with "certainty."²¹ Nevertheless, even though *Tosafot*'s comments do not necessarily confirm *Nishmat Avraham*'s thesis, his position is nevertheless entirely cogent.

That analysis is cogent only if it is assumed that the disparity between the lesser burden that must be accepted in order to fulfill a positive *mizvah* and the greater burden that must be assumed in order to avoid transgressing a negative commandment reflects the severity of a negative commandment, as evidenced by the nature of punishment meted out for infraction, as opposed to the lesser transgression involved in simply not fulfilling a *mizvah*. Alternatively, the distinction may be between an overt act of transgression and merely passive non-performance. The difference between those two rationales would become manifest in situations in which the negative commandment forbids nonintervention, e.g., "You shall not stand idly by the blood of your fellow" (Leviticus 19:16), commanding rescue of an endangered life. That commandment is couched in negative nomenclature but transgression is in the form of passive non-intervention. If it is the formal terminology that governs the extent of financial burden, a person would be required to expend his entire fortune in order to save a life; if it is only avoidance of an overt act that requires a higher degree of financial sacrifice, the potential rescuer's obligation would be limited to one-fifth of his fortune.²² Similarly, if only avoidance of an active transgression requires sacrifice of one's entire fortune, a married woman threatened with rape would not be required to make that sacrifice despite the fact that breach of a negative prohibition entailing capital punishment is involved.²³

²¹ See *Contemporary Halakhic Problems*, I, 390–391.

²² See R. Abraham I. Kook, *Mishpat Kohen*, no. 144, sec. 17.

²³ See R. Shlomoh Eger, *Gilyon Maharsha* 157:1 and *Pithei Teshuvah*, *Yoreh De'ah* 157:4.

If the distinction is active transgression as opposed to passive nonperformance, it might then be the case that the converse is also true, *viz.*, avoiding overt transgression of a prohibition derived from a positive commandment would also require sacrifice of one's entire fortune. An example would be consuming the flesh of a human cadaver according to Rambam's categorization of that prohibition. The phrase "these are the animals which you may eat" (Leviticus 11:2) introduces the criteria that serve to identify kosher species. Human cadavers are not among the species permitted on the basis of those criteria. Rambam, *Hilkhot Ma'akhalot Assurot* 2:3, codifies the prohibition against consuming human flesh as a *lav ha-ba mi-klal aseh*—a negative prohibition deduced from a positive declaration.²⁴ According to Rambam, the verse should be interpreted as, in effect, declaring "these are the animals which you may eat—but you may not eat species that do not manifest these criteria." How much must one expend in order to avoid cannibalism in the face of starvation? If the extent of financial responsibility is governed by a positive or negative formulation of the commandment, since the prohibition against consuming human flesh is derived from affirmative language, avoidance of transgression does not require expenditure of an entire fortune; however, if the governing consideration is avoidance of an overt act, *viz.*, eating, then a person would be obligated to expend his entire fortune in order to avoid transgression.

The same principle applies to deriving benefit from a corpse. Assuming that the prohibition against deriving benefit from a cadaver is biblical in nature, the prohibition is not stated in negative terminology. Hence, it may be argued that one need not expend more than one-fifth of one's capital in order to avoid transgression. It may certainly be assumed that loss of a limb or organ is equal to or exceeds the value of one-fifth of a person's estate. That consideration notwithstanding, it is not clear that a person would be willing to expend a fifth of his net worth in order to acquire a dental implant. Indeed, many people would not. Although he states the matter somewhat differently, *Teshuvot Havvot Ya'ir*, no. 183, expresses some hesitation with regard to whether potential loss of the external portion of an ear is to be equated with the loss of a limb.

²⁴ Other authorities disagree. Re'ah, cited by *Shitah Mekubbezet*, *Ketubot* 60a, maintains that consumption of human flesh is forbidden on the basis of an *a fortiori* inference from a negative commandment. See also *Maggid Mishneh*, *Hilkhot Ma'akhalot Assurot* 2:3. Ra'avad, *Torat Kohanim*, *Parashat Shemini* as well as Ramban and Rashba, *Ketubot* 60a, deny that human flesh is forbidden by an *issur aseh*. But all authorities agree that such is the status of a number of other forbidden foods, e.g., the meat of non-sacrificial animals slaughtered in the courtyard of the Temple. For a complete enumeration, see *Encyclopedia Talmudit*, II (Jerusalem, 5716), 90.

Shulhan Arukh, Orah Hayyim 328:17, prohibits violation of a negative Sabbath commandment in order to avoid loss of a limb. *Pri Megadim* distinguishes between Sabbath prohibitions and other negative commandments by categorizing the former as “more severe,” presumably because such Sabbath transgressions are capital offenses. R. Moshe Sternbuch, in a contribution to *Yad Sha’ul* (Tel Aviv, 5713), ed. R. Yechiel Ya’akov Weinberg and R. Pinchas Biberfeld, pp. 371–375, and reprinted in R. Yechiel Ya’akov Weinberg’s *Seridei Esh*, I (Jerusalem, 5721), pp. 303–308, resolves the contradiction between *Shakh* and *Shulhan Arukh* in a different manner. Rabbi Sternbuch observes that *Shakh* addresses a case of external *force majeure*, i.e., a person who is ordered to transgress upon pain of loss of a limb for failure to do so. *Shulhan Arukh*’s ruling regarding violation of *Shabbat* proscriptions for purposes of avoiding loss of limb is recorded in the context of situations involving voluntary transgression in order to avoid loss of limb. Rabbi Sternbuch regards *Shakh* as permitting transgression of a negative commandment only in face of *force majeure*. The distinction is that an act compelled by *force majeure* is not at all regarded as a voluntary act because the actor’s will is subjugated to, and determined by, the will of the oppressor, whereas an act voluntarily performed to avoid natural consequences is deemed to be freely willed and is sanctioned only on the basis of the principle “and you shall live by them” (Leviticus 18:5).²⁵

A distinction of this nature was earlier formulated by a number of scholars in order to resolve that contradiction.²⁶ That distinction emerges from what would otherwise be a discrepancy between Rambam’s rulings in *Hilkhot Yesodei ha-Torah* 5:4 and 5:7. In codifying the obligation to suffer martyrdom rather than transgress one of the three cardinal sins, Rambam, *Hilkhot Yesodei ha-Torah* 5:4, rules that a person who does transgress in succumbing to external *force majeure* is not subject to the death penalty whereas, in *Hilkhot Yesodei ha-Torah* 5:7, Rambam rules that a person who incurs such a sin in order to avoid death as the result of illness is subject to the prescribed statutory punishment. Those scholars

²⁵ If Rabbi Sternbuch’s understanding of *Shakh* is correct there is not necessarily any dispute between *Shakh* and Maharshal. Maharshal addresses only a situation involving voluntary transgression of a negative commandment by a sick person in order to avoid loss of limb. If there is no conflict, *Shakh*’s citation, *Yoreh De’ah* 179:1, of *Teshuvot Maharshal* without further comment is quite understandable. Cf., *supra*, note 12.

²⁶ See R. Meir Simchah ha-Kohen of Dvinsk, *Or Sameah*, *Hilkhot Yesodei ha-Torah* 5:7 and R. Shlomoh Zalman Auerbach, *Minhat Shlomoh*, I, no. 18, sec. 5, s.v. *akah*. See also *Bet Meir*, *Even ha-Ezer* 178:3 and *Teshuvot Noda bi-Yehudah*, *Mahadura Tinyana*, *Yoreh De’ah*, no. 161, as well as R. Joseph Babad, *Minhat Hinukh*, no. 296.

explain that an act compelled by threat of death is an act performed under duress and, as such, is not attributed to the free will of the actor, whereas, in the absence of an external threat, the act is regarded as determined solely by the will of the transgressor.

III. PERMITTED VS. FORBIDDEN BENEFIT

Assuming that benefit derived from a corpse is biblically prohibited, there is a significant controversy with regard to the ambit of that prohibition. Many authorities²⁷ regard the biblical prohibition to be limited to benefits derived *ke-derekh hana'ah*, i.e., benefits that accrue through use in a manner that is customary or usual in nature. Other authorities²⁸ maintain that even “unusual” forms of benefit are biblically prohibited. Use of bone fragments for grafting purposes is not a “usual” use of bones.²⁹ As quoted by *Nishmat Avraham*, *Yoreh De'ah* 349:1, note 1, R. Shlomo Zalman Auerbach maintained that it is forbidden to derive unusual benefit only from a Jewish corpse that requires burial. Accordingly, since in

²⁷ See R. David ibn Zimra, *Teshuvot Radvaz*, III, no. 147 and R. Samuel Landau, *Teshuvot Shivat Zion*, no. 62.

²⁸ See also R. Shlomo Lipschitz, *Hemdat Shlomo*, *Orah Hayyim*, no. 38; *Or Sameah*, *Hilkhot Yesodei ha-Torah* 5:6; R. Joseph Rosen, *Zofnat Pa'aneah*, *Mahadura Tinyana*, *Hilkhot Yesodei ha-Torah* 5:8; and *Minhat Hinnukh*, no. 296. See also R. Joseph Teomim, *Ginat Veradim* (Pietrkov, 5644), preface, p. 11; *Hiddushei R. Akiva Eger*, *Yoreh De'ah* 349:1; R. Shlomo Kluger, *Mei Niddah* (Zolkova, 5595), p. 52; and *Iggerot Mosheh*, *Yoreh De'ah*, I, no. 230, *anaf* 3.

²⁹ R. Asher Weiss, *Teshuvot Minhat Asher*, II, no. 71, concedes that such use was unknown in earlier times but argues that under contemporary circumstances such use has become “usual.” That contention would certainly be rejected by the latter-day authorities who regard visual examination of cadaver organs for educational or scientific purposes as a “benefit” but “unusual” in nature. See *Contemporary Halakhic Problems*, II, 63–64. There are certainly other uses to which animal bones are put. Absent a prohibition, human bones could be used for the same purposes. Such use would represent the “usual” and “normal” benefit to be derived from bones. Artificial uses, such as visual examination and bone grafting, are not purposes for which bones are designed.

R. Moshe Feinstein, *Iggerot Mosheh*, *Yoreh De'ah*, I, no. 230, *anaf* 5, explicitly categorizes transplants as *she-lo ke-derekh hana'ah*. However, *Iggerot Mosheh* defines *she-lo ke-derekh hana'ah* in a different manner. Normal and usual benefit, he defines, as the type of benefit for which the object would be employed by people in general. A person who uses the object in an idiosyncratic manner puts the object to an “unusual” use. In general, according to *Iggerot Mosheh*, a cadaver has no beneficial use at all. Most people do not make use of a cadaver for educational, scientific, or therapeutic purposes. Accordingly, any and all use of a cadaver is “unusual” and results in a benefit of an unusual nature.

his opinion only “ordinary” or “usual” benefit may not be derived from a non-Jewish cadaver, Rabbi Auerbach maintained that unusual benefit should be permitted if necessary “for purposes of a *mizvah*.”³⁰

Rabbi Weiss suggests that, since bone becomes “reanimated” in transplantation, benefit, when it is derived, is derived from living tissue. That argument was advanced much earlier by R. Iser Yehudah Unterman, *Shevet mi-Yehudah*, I (Jerusalem, 5715), addenda, pp. 314–315, with regard to cornea transplants and is of even greater import with regard to transplantation of cadaver organs such as a kidney. That consideration would also obviate any obligation with regard to burial.³¹

Rabbi Unterman is concerned that a cornea transplant may involve a possible violation of the stricture against deriving benefit from a cadaver. In addressing that issue, he raises a more basic question: Scripture records instances of resurrection of dead persons by the prophets Elijah and Ezekiel. Rabbi Unterman queries whether it was permissible for others to derive benefit from what were essentially corpses restored to life. He might just as readily have pondered whether the obligation to bury a corpse would have required burial of those individuals since they had indeed died and were “living corpses.” Those questions are readily resolved by analogy to a third question that was directly addressed by the Sages, *viz.*, the question of whether a resurrected corpse causes defilement. The Gemara, *Niddah* 70b, discusses the question of possible defilement by a person resurrected by a prophet during the eschatological era and declares: “The corpse defiles; but the living person does not defile.” In other words, a person’s corpse defiles, not because the person *has* died, but because the corpse *is* dead. Upon resurrection, the corpse is no longer dead, and hence does not defile. Applying that principle, it is logical to assume that only the dead require burial and it is forbidden to benefit only from a dead body. In essence, death and status as a corpse is nullified upon resurrection.

Rabbi Unterman applies the same line of reasoning with regard to transplanted organs and tissue. The transplanted organ or tissue when integrated in the body of the recipient is no longer dead tissue. Since the organ is now “alive” there is no prohibition against deriving benefit from the tissue of a cadaver nor does such tissue cause defilement.³²

³⁰ See *Contemporary Halakhic Problems*, II, 63–64. See also *supra*, note 3 and accompanying text.

³¹ See R. Iser Yehudah Unterman, *Shevet me-Yehudah*, I, addenda, p. 322.

³² Rabbi Shlomoh Zalman Auerbach, quoted in *Nishmat Avraham*, *Yoreh De’ah* 349:2, note 3, p. 262, does not take issue with Rabbi Unterman’s argument regarding the status of the transplanted organ *post factum* but points out that the transplant

Rabbi Unterman describes his thesis as “novel,” and even “at first glance, bizarre,” but attributes the absence of its formulation by any earlier scholar to the fact that transplantation and “revivication” of tissue were unknown until recent times. In point of fact, his “novel” view was earlier formulated by a Moroccan scholar, R. Yeshu’ah Shimon Ovadiah, *Teshuvot Yesamah Levav, Yoreh De’ah*, no. 45. Rabbi Unterman’s view was later accepted by *Teshuvot Yabi’a Omer*, III, *Yoreh De’ah*, no. 23, sec. 27 and R. Joshua Neuwirth as quoted by *Nishmat Avraham, Yoreh De’ah* 349:2, note 3, pp. 261 and 262.

R. Moshe Feinstein, *Iggerot Mosheh, Yoreh De’ah*, I, no. 230, *anaf* 8, reaches a conclusion quite similar to that of Rabbi Unterman on the basis of a different, but perhaps no less radical, thesis. *Iggerot Mosheh* argues that, for purposes of defilement, tissue of a cadaver loses its status when transformed by being put to a utilitarian purpose. That paradigm is the rule pertaining to human skin. The skin of a cadaver has the status of flesh for purposes of defilement. Nevertheless, when the skin is tanned and turned into leather, it no longer defiles. The Gemara, *Niddah* 55a, records in the name of Ula that skin loses its capacity to defile at the very beginning of the tanning process even though it is still fit for consumption by an animal. Rambam, *Hilkhot Tum’at Met* 3:11, rules in

may be halakhically precluded for a different reason, *viz.*, the obligation to bury the entire corpse is occasioned immediately upon death of the individual. Use of the organ as a transplant thwarts fulfillment of the *mizvah* of burial. Resurrection of a dead body similarly defeats the *mizvah* of burial but is sanctioned because it involves the rescue of a life. A similar view was also expressed by R. Joseph Shalom Eliashiv, *Moriah* (Elul 5764), p. 170. See *Tosafot, Bava Mezi’a* 114b, s.v. *amar leih*. The same is not true of tissue transplanted for non-life saving purposes. Cf., *Teshuvot Yabi’a Omer*, III, *Yoreh De’ah*, no. 22, sec. 23, who implies that there is no obligation to inter organs that will be restored to life. However, *Teshuvot Yabi’a Omer* does not explain why he assumes that to be the case.

Rabbi Auerbach’s objection may be countered by invocation of *Shakh*’s ruling to the effect that even a negative commandment may be violated in order to preserve a limb or an organ. Thus, there are grounds to sanction abrogation of the *mizvah* of burial and of the prohibition against allowing a corpse to remain unburied in order to preserve a limb or an organ.

In any event, Rabbi Auerbach’s objection is not germane in instances of a bone fragment of less than a *ke-zayit* if it is assumed that a lesser amount does not require burial. See *supra*, note 5.

In the third edition of *Nishmat Avraham* (Jerusalem, 5774), *Yoreh De’ah* 349:1, note 4, p. 575, Dr. Abraham reports that Rabbi Auerbach’s reaction to the concept of “revivication” was that it does not justify use of the organs of a deceased individual other than for purposes of *pikuah nefesh*. Rabbi Auerbach’s consideration was that the deceased retains a “property interest” in his organs. For an interesting homiletical analysis congruent with that view see R. Ben Zion Firrer, *Panim Hadasot ba-Torah* (Jerusalem, 5735), vol. IV *Parashat Hukkat*, pp. 126-128.

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accordance with Ula. In the same vein, the Gemara, *Hullin* 122b, declares that the ear of a donkey that is fashioned into a purse no longer defiles as animal carrion. Similarly, argues *Iggerot Mosheh*, tissue used in organ transplantation has been converted from cadaveric tissue to material serving a utilitarian function and hence loses capacity to defile. Transformation and nullification of the status of the organ as cadaveric tissue occurs immediately upon commencement of the process of implantation just as skin loses status as flesh of a cadaver at the very beginning of the tanning process. Thus, in organ transplants, the tissue used in transplantation loses capacity to defile even before the organ is revived by integration into the body of the recipient.

Applying *Iggerot Mosheh's* thesis to the cadaveric material used in bone grafts, it is certainly arguable that the bone fragments lose capacity to defile even before use in the implantation process. The process of preparing the grafted material would seem to be analogous to the tanning process employed in causing skin to become leather. If so, initiation of the process of preparing the bone and compounding it with binding substances serves to transform its purpose and nullifies its status as cadaveric tissue. As a result, it may be concluded that bone treated in such a manner loses capacity to defile even before the implantation process has begun.

In transplantation of an organ such as a kidney the organ is indeed integrated in the body of the recipient and becomes "alive." That consideration, however, intriguing as it is, may be irrelevant to the question of bone grafts. Unlike other organ transplants, a bone graft remains inert in the body of the recipient. Although the grafted bone bonds with the natural bone and becomes inseparable from its new site, it is not physiologically integrated in the jaw of the recipient.

The theses developed by Rabbi Unterman and *Iggerot Mosheh* may seem to be coextensive in application but, in actuality, they are not. In particular, dental implants are an example of a transplant in which *Iggerot Mosheh's* approach is applicable but that of Rabbi Unterman is not. In the process of osseointegration the implanted material becomes inseparably incorporated within the natural bone tissue. Indeed a Swedish scientist reports that the bone tissue was observed to have actually grown into the very thin spaces within implanted titanium.³³ Nevertheless, the implanted material remains inert; it is not nurtured by the blood supply of the host and metabolic processes do not take place within the grafted material. It seems to this writer that Rabbi Unterman and those authorities who

³³ Dr. Per-Ingvar Branemark, "Osseointegration and its Experimental Background," *Journal of Prehistoric Dentistry*, vol. 50, no. 3 (1983), p. 399.

advance a notion of “revivication” would concede that a dental implant does not become newly “alive.” However, inseparable incorporation within the existing natural structures represents an absolute form of bonding. Thus, according to *Iggerot Moshch*, in implantation, cadaveric material loses its capacity to defile while for Rabbi Unterman, it does not.

Assuming that it is prohibited to derive benefit from the bones of a cadaver, the issue is whether the prohibition is attendant even upon the small quantity of pulverized bone used in a dental graft. R. Zevi Pesach Frank, *Teshuvot Har Zevi, Yoreh De'ah*, no. 277, expresses doubt with regard to how the threshold of the benefit that may not be derived from a corpse is to be determined. Is the threshold to be calculated on the basis of value, i.e., the value of a *perutah*, a small copper coin of the talmudic period that represents the halakhic threshold of monetary value, or is it to be defined in terms of the quantity of the object from which benefit is derived, i.e., tissue having the weight equal to the weight of an olive? The latter quantity, a *ke-zayit*, is the minimum quantity of forbidden food that, when consumed, results in statutory punishment. The quantity of bone fragments used in dental reconstruction is far less than the equivalent of the weight of an olive. Even the lesser prohibition in the form *hazi shi'ur*, i.e., benefit not great enough to result in statutory punishment, is viewed by *Har Zevi* as not applicable. A quantity less than the minimum required for culpability is forbidden only because it can be combined with other lesser quantities to achieve the threshold level for which punishment would be incurred. Only minimum quantities of tissue are used in transplantation, not simply because large quantities are unnecessary, but because larger quantities would thwart the efficacy of the procedure. Accordingly, argues *Har Zevi*, since tissue used for implantation is not suited to combination with another similar quantity of tissue, use of such minimal quantities is entirely permissible.

IV. PRIESTLY DEFILEMENT

Virtually all authorities agree that a *kohen* may not defile himself either by touching or “carrying” a non-Jewish cadaver.³⁴ Less than a *ke-zayit* of flesh derived from a corpse does not cause defilement. The Mishnah,

³⁴ R. Eliezer of Metz, *Sefer Yere'im*, no. 322, is the sole authority who maintains that a *kohen* may come into contact with a non-Jewish corpse. Rambam, *Hilkhot Tum'at Met* 1:12–13 rules that a *kohen* may be in the same tent as a non-Jewish cadaver but may not otherwise come into contact with the cadaver while *Tosafot, Yevamot* 61a, s.v. *me-mega*, maintains that there is no difference between Jewish and

Obolot 2:4, records a controversy between R. Akiva and R. Yohanan ben Nuri with regard to whether flesh equal to a *ke-zayit* when severed from a corpse continues to defile by tactile contact even after being divided into two pieces. Rambam, *Hilkhot Tum'at Met* 4:5, rules that although such smaller particles do not continue to defile by means of touching, they continue to cause defilement by means of “carrying” if their aggregate volume is equal to a *ke-zayit*. The regulations with regard to bones of a cadaver are somewhat different. Rambam, *Hilkhot Tum'at Met* 3:2, records that tactile contact with bone severed from a corpse serves to defile by means of tactile contact even if the bone fragment is equal in size only to “a grain of barley.”³⁵ Nevertheless, bone the size of “a grain of barley” that is subsequently divided into smaller fragments continues to defile by means of “carrying.” Bones of a cadaver defile by means of being present within a “tent” if their volume is equal to one-fourth of a *kav*.

Bone tissue used in dental implants is pulverized. Since no single particle even remotely approximates the size of “a grain of barley” that material cannot cause defilement by “touching.” However, pulverized bone equal to a grain of barley does cause defilement by “carrying.” If so, since the implanted particles of pulverized bone in the aggregate are greater than “a grain of barley,” it would seem to be the case that the recipient should become defiled as he “carries” the implant.

However, that conclusion is contradicted by the Gemara, *Nazir* 13b. The *Mishnah* declares that a Nazarite is defiled by “carrying” only a minimum quantity of half a *kav* of bones.³⁶ The Gemara queries the cogency

non-Jewish cadavers. See *Shulhan Arukh, Yoreh De'ah*, 372:1 and *Shakh, Yoreh De'ah*, 372:4.

³⁵ In this context, the *se'orah*, or grain of barley, may be a unit of length rather than a unit of volume. According to the calculation of *Hazon Ish*, the length of a *se'orah* is equal to 1.07 centimeters. See R. Israel Sokel, *Kuntres ha-Shi'urim* (Bnei Brak, 5769), sec. 7. According to R. Chaim Noe, the length of a *se'orah* measures 1 centimeter. See R. Chaim Noe, *Sefer Shi'urei Torah* (Jerusalem, 5707), p. 24. Cf., R. Yechiel Michel Gold, *Me'asef le-Khol ha-Mahanot* 27:4 and R. Chaim Benis, *Middot ve-Shi'urei Torah* (Bnei Brak, 5747) 7:27. Cf., however, R. David Munk and R. Yochanan Alexander Lombard, *Taharat ha-Kohanim* (Jerusalem, 5762), p. 86, who give the measurement of a *se'orah* as 3 centimeters by 1 centimeter but express doubt with regard to whether it is a unit of measure or a unit of volume.

³⁶ According to *Hazon Ish*, a *kav* equals 2.4 liters, half a *kav* equals 1.2 liters and a quarter of a *kav* equals 600 cc; according to R. Chaim Noe, a *kav* is equal to 1.38 liters, half a *kav* equals 691 cc and a quarter of a *kav* equals 344.5 cc; or, according to Rabbi Benis' analysis of Rambam's position, a *kav* equals 1.2 liters, a half *kav* equals 60 cc and a quarter of a *kav* equals 300 cc. See *Middot ve-Shi'urei Torah* 14:9. Cf., *Taharat ha-Kohanim*, p. 84 where the volume of the quantity of one-fourth of a *kav* is given as between approximately 300 and 600 cc.

of that rule since a half a *kav* is twice the quantity of bone required to defile by virtue of being in the same tent and, quite obviously, is much larger than the equivalent of a grain of barley that defiles by “carrying.” The Gemara responds that the larger quantity of half a *kav* stated as the minimum quantity that causes defilement applies only to bones “turned into flour.” Rashi explains that, although smaller fragments of solid bone cause defilement, only half a *kav* of ground or pulverized bone has the capacity to cause defilement. *Hazon Ish*, *Obolot* 21:12, explains that the reason for the distinction between solid and pulverized bone is that even a small sliver of bone is recognizable as such whereas ground bone is no longer recognizable as a bone.³⁷

If so, even pulverized bone used in an implant would not, at least in theory, present a problem with regard to defilement. There can be no problem with regard to “carrying” the implant by the *kohen* who is the recipient because the quantity of cadaveric material utilized in an implant is far less than the quantity of half a *kav*. Furthermore, it is extremely unlikely that a dental office would have such a large quantity on hand at any particular time. If so, neither the dentist nor the patient could become defiled by entering the “tent” in which the cadaveric material is present.

Rambam, however, fails to record any distinction between bone fragments and pulverized bone with regard to the minimum quantity capable of causing defilement. The *Brisker Rav*, R. Yitzchak Zev Soloveitchik, *Hiddushi ha-Griz al ha-Rambam*, *Hilkhot Nezirut* 7:4, endeavors to explain why Rambam does not regard the Gemara’s distinction as normative.³⁸ If so, it should follow that, according to Rambam, bone tissue reduced to a powder is treated as the bone from which it originated and would cause defilement by means of “carrying” even if it is equal in size only to a kernel of barley. Nevertheless, even according to Rambam, pulverized bone equal in size to “a grain of barley” used in dental implants will not cause defilement by means of “touching.” Rambam, *Hilkhot Tum’at Met* 5:5, rules that parts of a corpse smaller than the minimum required to cause defilement can no longer cause defilement even if the particles are later recombined and coalesce into a single fragment as a result of human intervention and, upon recombination, constitute more than a minimum quantity. Thus, the powdered bone, even when recombined into a single entity by means of a binding agent, would not defile by tactile contact since each particle of the pulverized bone remains

³⁷ Cf., R. Gershon Chanoch Leiner, *Sidrei Taharot*, *Obolot*, p. 67a, who comments that ground bone is “*nitbatel mi-torat ezem*—has lost the status of bone.”

³⁸ See also *Shi’urei Rabbenu Meshullam David*, *Nazir*, no. 143.

discrete and falls short of the minimum quantity capable of causing defilement by “touching.”

However, as noted, the rule with regard to defilement by “carrying” is different in that the minimum quantity of bone equal to a barley grain need not be in the form of a single bone fragment because, unlike “touching,” the entire quantity of bone is “carried” simultaneously. Rabbi Shabtai reports that dental practitioners estimate that the amount of bone used in a typical implantation procedure is equal to two or three grains of barley.³⁹ If so, according to Rambam, the cadaveric implant should defile when “carried” by the patient.

Nevertheless, there may be another reason why the cadaveric implant may not cause defilement even by “carrying.” The Gemara, *Niddah* 42a, states that, although there is a controversy with regard to whether defilement can be caused by an object concealed in an “inner place,” e.g., in a body cavity, it is nevertheless agreed that a “swallowed” entity, i.e., an object concealed within the body tissue, cannot cause defilement. Thus, if the cadaveric implant under discussion is covered by gum tissue it becomes “swallowed” within the body and can no longer cause defilement. However, such an implant would fail to cause defilement only after it is sealed in place beneath the gum. Accordingly, the patient might become defiled immediately upon placement of the implant in the exposed jaw by “carrying” the cadaveric material before it is covered by the gum. Similarly, the dentist would become defiled in the act of transferring the implant into the mouth from the site of its preparation.

Moreover, although even a thin layer of gum tissue would ostensibly create a situation of *tum’ah belu’ah*,” i.e., “swallowed defilement,” that principle would be of no avail in eliminating the problems of defilement associated with dental implants. Although a thin layer of gum tissue is replaced over the implant that tissue remains *in situ* only until osseointegration is complete. When the jaw becomes capable of supporting an artificial tooth, the gum tissue is removed and an abutment is attached to the dental implant. The gum tissue is then closed around, but not over, the abutment. The crown is then placed over the abutment.⁴⁰ At that point the defilement is no longer “swallowed.”

Rabbi Weiss’ interlocutor, *Teshuvot Minhat Asher*, II, no. 72, assumes that the status of pulverized bone is that of *rekev* and causes defilement

³⁹ See *Kol Azmotai Tomarnah*, p. 8.

⁴⁰ Mayo Clinic, “Dental Implant Surgery: What You Can Expect,” <http://www.mayoclinic.org/tests-procedures/dental-implant-surgery/details/what-you-can-expect/rec-20245754>.

only if the *rekev* consists of a minimum quantity of *melo tarvad*, or a quantity that can be contained within two hands placed together.⁴¹ Rambam and R. Ovadiah of Bartenura, in their respective commentaries on *Oholot* 22:1, define *rekev* as “dust” that is the residue of a cadaver when it no longer has any moisture and its bone has decomposed. However, as Rabbi Weiss points out, Rambam, *Hilkhot Tum’at Met* 3:6, rules that the residue of a corpse is reduced to the status of *rekev* only if its degeneration occurs naturally without human assistance in the form of “grinding.” More significantly, as recorded by Rambam, *Hilkhot Tum’at Met* 3:4, the status of *rekev* pertains only if the process of decomposition affects the entire body, but not if a limb is severed and allowed to decompose. In preparing bone tissue for implantation, it is clear that the bone is removed from the cadaver and that it undergoes transformation that does not occur in the rest of the body.

There are yet other reasons why there is no cause for defilement. 1) In accordance with the first opinion recorded in the Mishnah, *Niddah* 56a, the flesh of a corpse defiles even when it has become dried. However, if the flesh shrinks to the point that it becomes “as earth,” i.e., it disintegrates and crumbles, it no longer defiles. Rabbi Weiss suggests that the pulverized bone, when treated by chemicals, becomes completely “dried” with the result that the bone tissue no longer has capacity to cause defilement. However, as Rabbi Weiss himself points out, R. David ibn Zimra, *Teshuvot Radvaz*, III, no. 548, rules that the crumbled tissue of a mummy does cause defilement. Nevertheless, Rabbi Weiss notes that the Mishnah, *Oholot* 2:2, declares that tissue that has been burned does not

⁴¹ The word “*tarvad*” is a reference to a spoon-like implement that was used by physicians. See *Kellim* 17:12. The term “*melo tarvad*” denotes a quantity equal to that which can be contained with two hands cupped together. See Rambam, *Hilkhot Tum’at Met* 12:11. It has been suggested that the word “*tarvad*” is a contraction of the words “*trei yad*,” i.e., “two hands.” See Marcus Jastrow, *A Dictionary of the Targumin, Talmud Babli and Jerushalmi, and the Midrashic Literature* (New York, 1950), p. 1696, s.v. *tarvad*.

According to *Tosafot*, *Shevu’ot* 10b as well as Rabbenu Gershom and *Shitah Mekubbezet*, *Ketubot* 6b, a *melo tarvad* is the equivalent of approximately one-half of a *manah*; according to *Tosafot*, *Keritut* 6b, it is the equivalent of one-fifth of a *manah*. A *manah* equals one hundred silver denarii and the weight of a single dinar is equal to 96 grains of barley. The weight of a grain of barley is the subject of significant controversy. *Middot ve-Shi’urei Torah* 26:5 gives the weight of a single dinar as 4.25 grams. Accordingly, *melo tarvad* would equal 2,125 grams or 850 grams. A comprehensive summary of sources is presented by Jacob Gershon Weiss, *Middot u-Mishkalot shel Torah* (Jerusalem, 5745), part 1. Cf., the subsequent discussion of R. Samuel Ze’ev Reich, *Massoret ha-Shekel* (Toronto, Canada, 5748). *Massoret ha-Shekel*, pp. 17 and 119, state that the weight of a *manah* is 350.7825 grams.

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cause defilement and asserts that the effect of the chemical treatment to which the bone is subjected is tantamount to “burning” the bone tissue. There is, however, no source that serves as a basis for equating chemical transformation with carbonization that results from burning by means of fire. 2) Rashi and *Tosafot, Nazir* 52a, indicate that a barley-size fragment of bone continues to cause defilement after being reduced in size but only if the bone segments are derived from a single corpse.⁴²

Presumably, whether the cadaveric material used in any particular implant is derived from a single cadaver or from multiple cadavers cannot be determined. Accordingly, in practice, since Rambam’s view is a minority opinion and it is doubtful that the bone is derived from a single cadaver, a *kohen* need not be concerned with regard to defilement.

⁴² The *Brisker Rav, Nazir* 53b, is of the opinion that the two fragments must also be of the same bone. However, that view is contradicted by *Hazon Ish, Oholot* 21:7 and *Sidrei Taharah, Oholot* 42b, s.v. *le-afukei*, and 66b, s.v. *ezem*.